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A Monthly Review of Veterinary Science.

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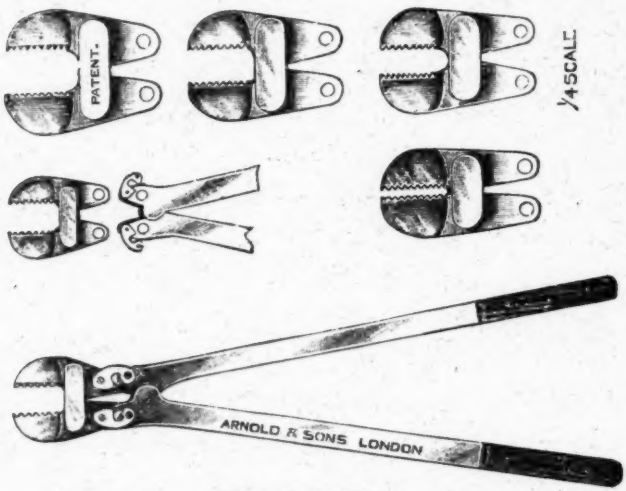

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CONTENTS.

PAGE

Principal METTAM, B.Sc., M.R.C.V.S. 449

EDITORIALS—

The Royal Commission on Tuberculosis 450

The National Veterinary Association 452

GENERAL ARTICLES—

Some Debatable Points of Unsoundness in Horses. By GERALD BLOXSOME, M.R.C.V.S. 453

Contribution to the Ophthalmic Reaction obtained with Bovo-Tuberculin D (Merck). By Veterinary-Surgeon ABEL-GRABEN 457

The Formation of Hydrocyanic Acid from Linseed Cake. By G. D. LANDER, D.Sc., F.I.C. 461

Bovine Pyelo-Nephritis in Victoria due to a Bacillus distinct from the Bacillus of Enderlen. By J. A. GILRUTH, D.V.Sc., M.R.C.V.S., F.R.S.E. ... 464

A Variety of the Vibrion Septique (Bacillus of Malignant Œdema), Non-Pathogenic for Rabbits. By J. A. GILRUTH, D.V.Sc., M.R.C.V.S., F.R.S.E. 471

CLINICAL ARTICLES—

Rupture of the Diaphragm and Strangulated Diaphragmatic Hernia. By H. A. STEWART, Lieut. A.V.C. 475

Impaction of the Intestines, followed by the passage of Intestinal Cast eighteen inches long. By Captain A. J. WILLIAMS, F.R.C.V.S., A.V.C. 476

The Diagnosis of Bowel Troubles as regards its Terminal Portion. By G. MAYALL, M.R.C.V.S. 480

Fracture of the Tibia. By W. CAUDWELL, F.R.C.V.S. 481

Fracture of the Os Suffraginis. By Captain A. J. WILLIAMS, F.R.C.V.S., A.V.C. 481

Three Cases of Abnormal Retention of the Fœtus. By W. CAUDWELL, F.R.C.V.S. 483

The Treatment of Contagious Granular Vaginitis in Cattle. By A. LASZLÓ ... 484

Removal of Both Abdominal Testicles from a Cryptorchid through one incision. By FREDERICK HOBDAY, F.R.C.V.S. 486

CANINE CLINICAL NOTE—

A Case of Hodgkins' Disease. By FREDERICK HOBDAY, F.R.C.V.S. ... 486

Whitewash for Cowsheds 487

The President of the National Veterinary Association 488

ABSTRACTS—

Abstract from the Final Report of the Royal Commission on Tuberculosis ... 489

Effect on Milk of Water or Watery Food given to Cows 506

MISCELLANEOUS—

Royal College of Veterinary Surgeons 507

Unattached List for the Territorial Force 509

TRANSLATIONS—

A Case of Stercoral Concretion. Messieurs CAZALBOU and SERISE 510

Articular Rheumatism in a Dog, followed by Necrosis of Extremities. By Chief Veterinary-Surgeon FREISE 511

LETTERS AND COMMUNICATIONS, &c. 512

BOOKS AND PERIODICALS, &c., RECEIVED 512

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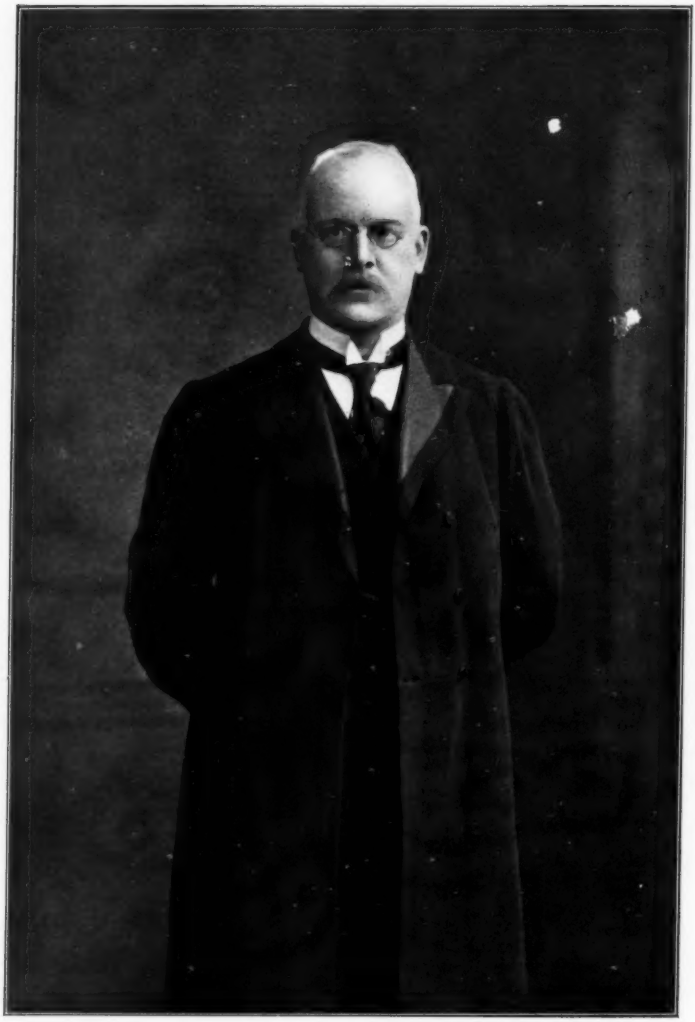

PROFESSOR A. E. METTAM, B.Sc., M.R.C.V.S., M.R.I.A.,

President of the Royal College of Veterinary Surgeons, and Principal of the Royal Veterinary College of Ireland.

THE

VETERINARY JOURNAL

AUGUST, 1911.

PRINCIPAL METTAM, B.Sc., M.R.C.V.S.

The President of the Royal College of Veterinary Surgeons.

The Council of the Royal College of Veterinary Surgeons must be congratulated on their selection of Professor Mettam to fill the presidential chair during such an important year as this, as very few men in the profession have attained so high a position and so much distinction in the world of science in so short a time.

Graduating in 1889 from the Royal (Dick) Veterinary College in Edinburgh, his hard-working student career was completed by the capture of the first Fitzwygram prize with 1,980 marks out of a possible 2,000, a result which would be hard to excel. In 1890 he returned to his Alma Mater as assistant to Professor (now Sir John) McFadyean, and in 1892 succeeded him in the Professorship of Anatomy, a position which he very ably filled and in which he gained the respect of all his students. In 1895, aspiring to further honours, Professor Mettam graduated as a Bachelor of Science in the Edinburgh University, with highest possible distinction, and in 1896 was elected George Heriot Research Fellow of the University.

In 1900 the idea of founding a Veterinary College in Ireland was brought to completion, and Professor Mettam was selected from a large number of applicants for the Principalship. How worthily the selection has been justified is shown by the results which have been attained. No College is more popular amongst the students, and no College is more prosperous. The buildings were all set up in accord with Professor Mettam's ideas—ideas culled from a tour amongst all the best Continental colleges, and modified or enlarged

upon as occasion demanded, with many original suggestions which have made it thoroughly up-to-date.

On the teaching staff, in addition to the duties of Principal, Professor Mettam occupies the Chair of Pathology and Bacteriology, and the high percentage of passes at the examinations bears evidence to the thoroughness of his teaching.

In 1902 he was elected a member of the Royal Irish Academy, and at the present time he is the senior Vice-President of the Royal Zoological Society of Ireland, of whose Council he has been a member for the past seven years.

His contributions to science have been many, especially to the veterinary periodicals and to various societies, including the Royal Irish Academy, and the Royal Academy of Medicine of Ireland; and quite recently, by way of direct variation from the paths of study, he was made the "Officer Commanding" the Royal Veterinary College of Ireland Officers' Training Corps. His many and varied qualities will make every member of the profession feel sure that the helm of their particular ship is in capable hands, and will be guided quite serenely and safely through the troubled waters of another year.

Editorials.

THE ROYAL COMMISSION ON TUBERCULOSIS.

In this issue we give a rather full abstract of the final report of the above Royal Commission, and it goes without saying that it is full of most interesting and instructive information. We make no apology for the length of the abstract which, on the other hand, might have been even longer with advantage. Every word of it should be read and carefully assimilated, and it will repay the reader to make a careful analysis for himself of the cases recorded as to the occurrence in the human subject of tuberculosis caused by what has been described as the bovine tubercle bacillus.

The Royal Commissioners have been able to point out methods by which the origin of the bacilli in naturally occurring cases can be definitely ascertained, *i.e.*, whether of human or of bovine origin. The cultural characters and effects on experi-

mental animals are markedly different; but on the other hand they say "Distinction cannot accurately be made between the types of tubercle bacilli on the basis of microscopic characters alone." The Commissioners have not been able to produce any modifications or discover any transition stages from one type to another in experimental cases, *i.e.*, whatever organisms of bovine or human origin have been experimented with, their characters, both cultural and experimental, have remained unaltered. But they have found in naturally occurring cases, two forms of tubercle bacilli with characters resembling in part those of bovine origin and in part those of human origin. These two forms were found in lupus and in equine tuberculosis. Based on these facts the Commissioners are of opinion that in spite of their inability to produce transition stages the different types of tubercle bacilli must be regarded simply as varieties of the same organism. They have been able to prove conclusively that bovine tuberculosis is undeniably transmissible to the human being, and that it produces disease anatomically and histologically identical with human tuberculosis. In all such cases, therefore, human tuberculosis is the same disease as bovine tuberculosis.

That is, perhaps, the most notable of many very important pronouncements, and it should greatly strengthen the hands of those who are agitating for a crusade against bovine tuberculosis on account of the dangers to mankind. But as the President of the National Veterinary Association (Mr. T. Salusbury Price) so aptly remarked in the course of his excellent presidential address at the Carnarvon meeting, farmers have sufficient economic grounds for attempting to eradicate the disease apart from the transmissibility to man. He said: "Farmers should remember that the healthy cow is the one that thrives best, takes less food to do it, and is less expense in every way than the tuberculous cow." He suggested, and we agree with him, that it would pay the farmer himself to get rid of the disease and not wait for the Government to do it.

It must not, however, be forgotten that the consumptive human being is still the greatest factor in the spread of human tuberculosis, and the educational campaign for the dissemination of knowledge to the masses of the populace as to these various dangers must be persisted in, so that all and sundry may assist in checking the ravages of this terrible scourge.

It would be very regrettable if the labours of this Royal Commission were to cease at this stage, and we sincerely trust that they may be instructed to continue their investigations and assist in elucidating many of the still obscure problems relating to the disease.

THE NATIONAL VETERINARY ASSOCIATION.

THE National meeting of 1911 is now a thing of the past, and all who attended it are unanimous in their verdict that it has been a great success. It is certainly unfortunate that the attendance was somewhat smaller than the average, but what was lacking in numbers was quite compensated for by enthusiasm. The papers provoked excellent discussions, and the social events went with a swing that must have caused great satisfaction to the genial President, Mr. T. Salusbury Price, and the very energetic local Secretary, Mr. Wynn Lloyd, to whom the thanks of all who attended are certainly due.

A very important event was the acceptation by the National of the suggested alteration of rules to allow of affiliation with it of the various local societies. It is of importance to note that of eighteen societies which have reported on the scheme, three have decided against it, while fifteen have agreed to it either *in toto* or subject to minor alterations. The Association therefore considered it advisable to assent to the scheme, and the Committee which formulated the rules, with Dr. Bradley as Chairman, has been commissioned to proceed and arrange the necessary formalities for bringing the scheme to a workable conclusion. It is hoped that all the arrangements will be made and brought into effect at next year's meeting in Lancashire.

General Articles.

SOME DEBATABLE POINTS OF UNSOUNDNESS IN HORSES.*

By Gerald Bloxsome, M.R.C.V.S.
Brighton.

The rule as to unsoundness is, that if at the time of sale, the horse has any disease, which either actually does diminish the natural usefulness of the animal, so as to make him less capable of work of any description, or which in its ordinary progress will diminish the natural usefulness of the animal, or if the horse has, either from disease (whether such disease be congenital or arise subsequently to its birth), or from accident undergone any alteration of structure that either actually does at the time, or in its ordinary effects will diminish the natural usefulness of the horse, such a horse is unsound.

Soundness is another matter altogether. When we say that a horse is sound we mean that he is free from disease. The first point which I would draw your attention to is one that is common to every horse of four years old and upwards, namely splint.

You cannot legally give a certificate stating a horse to be sound when a splint is present, although it is frequently done.

Neither is it permissible to sell a horse with a splint as a sound horse; for the seller is in such circumstances liable to an action at law, and to being compelled to take the horse back. If he says he believes the horse to be sound, that is another matter, and he cannot then be compelled to take the horse back.

But the question in my mind is, should the presence of a splint constitute unsoundness. We all know that whilst a splint is in process of formation, lameness may and probably does exist, but when once compact bone tissue is formed there is no more fear of such recurring, or of the horse's usefulness being in any way impaired.

Then again, a good deal is made of the position of a splint, but when once formed, and the horse goes sound, I do not believe it makes the slightest difference where it is placed. Personally I would rather buy a horse with a splint than one without,

* Read at the meeting of the Southern Counties Veterinary Society.

for I believe that I should be obtaining the more valuable animal of the two.

The next defect for our consideration is sidebone, one of the scheduled hereditary unsoundnesses on the list of the Royal Commission on Horsebreeding. Clearly a horse with a sidebone, according to present law, cannot be deemed a sound horse; still hundreds of horses so affected are at work to-day, and their usefulness is not impaired on account of their being so affected.

I well remember when at College being astounded by a particularly bold statement from Professor Macqueen, "that he had never seen a horse lame from sidebone." At that time it was difficult for me to believe this; to-day I can honestly say, that where a sidebone is so far formed that one can positively state that it is present, I have never seen a horse suffering lameness from it. That horses do go lame from sidebone during the process of the replacement of the lateral cartilage by bone is, I believe, quite possible, but who is able to say positively when this is the case? There is absolutely nothing to see; no heat, no pointing, no alteration in the shape of the foot, perfect flexibility of the cartilage above the coronet, yet the lameness is there, persistent, and hidden in obscurity. It is reasonable to presume that in such a case, the replacing of a comparatively soft material, such as cartilage, between the sensitive laminæ and the pedal bone, by a hard, unyielding substance such as bone, must cause pain and consequent lameness. When, however, this change has extended throughout the entire extent of the cartilage, so that it is easily discerned by palpation above the coronet, it is complete below; the inflammatory condition has subsided, the parts have become adapted, and there is nothing to cause lameness. Certainly the presence of an upstanding piece of bone above the coronet does not cause it, as we can see by noticing the many hundreds of horses affected and in hard work every day, and who go perfectly sound. I think those of you who are in the habit of examining carthorses will bear me out in this. Take for instance those firms who, when replenishing their studs, are careful only to buy horses not less than four years of age, and free from sidebones, and watch those horses during their years of service, and you will find that at least 50 per cent. develop sidebone, unbeknown usually to their owners, and without showing lameness or impairing their usefulness.

Amongst hunters sidebone is of course not so common, but I have never seen a hunter with pronounced sidebones lame from them, and I can call to mind many instances of brilliant performers keeping perfectly sound with large sidebones.

The conclusion therefore that forces itself upon me is, that although we must clearly class sidebone as an unsoundness, still in the state that we are able to recognize it, it does not cause lameness. That it may cause lameness in the earlier stages is quite probable, and it is reasonable even to attribute many cases of obscure lameness in the foot to incipient sidebone.

Another point that often causes differences of opinion is a lumpy conformation of the distal extremity of the os suffraginis, which is so often confounded with ringbone. It is not the result of disease, and should not be classed as an unsoundness. It is generally seen in well-bred horses, such having but little connective tissue between the skin and the bone, and consequently the prominences show up more distinctly; but any class of horse occasionally shows this conformation. When present at all, it usually shows to some extent on all four limbs, so that we should not fall into the error of mistaking it for true ringbone, but I have done so myself I know on more than one occasion.

In examining at shows for hereditary unsoundness this is a particularly important point, and is explanatory of the fact of particular horses being passed as free from hereditary disease at one show, and being crabbed at the next. It is unfair to the owner, causes a great deal of bitterness, and sometimes personal animosity, and is certainly a point on which we should have an uniformity of opinion.

True ringbone, where the joint is involved, always causes lameness, but *every* enlargement round the neighbourhood of the coronet is not necessarily a ringbone, and I think we should be far more careful than we very often are in applying the term promiscuously to every coronary enlargement.

The last point that I intend referring to is perhaps the most important of all; it is what we may call "spurious spavin." I believe it to be a fact that more horses are "crabbed" for imaginary spavins than for anything else.

There seems to be a rooted idea that a state of soundness can only exist with absolute symmetry, which I cannot regard as a right or proper inference.

Take the human body, for instance. How many of us are there I wonder who have a pair of anything? We have two arms, two legs, two eyes, &c., but they are very seldom symmetrical. Similarly with horses we often find differences of conformation not the result of disease at all, and not unsoundness. Probably one of the commonest is extra development of the ridge of the cuneiform magnum. Now the extra development may be very, very slight, but cover it with the ligament, connective tissue, and skin, and the extra development becomes distinctly appreciable; it is just on the seat of spavin, and we wonder what we are to call it.

There is no getting away from the fact that we are in a disagreeable position. We may satisfy ourselves by every possible test that the enlargement is not the result of disease but a matter of conformation only, but there is this appreciable difference between the two hocks which others may be able to see as well as ourselves. Very possibly the owner or purchaser may show the horse to some other practitioner and casually ask his opinion of that hock. This gentleman probably has not the chance to make the careful examination that we have done; he merely looks at it, compares it with the other, and says, "Oh yes, there is a spavin there." The owner says, "I thought so," or "I was afraid there was"; and though that horse may go sound for years, he will always believe that a spavin is there.

Sometimes both hocks are similarly affected and appear lumpy; in this case the diagnosis should be greatly simplified. It is most unusual, if not impossible, for a spavin to form in each hock simultaneously, and the facts that the two hocks are symmetrical, that there is no lameness, and that both hocks are flexed to the same extent, should be quite sufficient ground to prove the absence of spavin.

CONTRIBUTION TO THE OPHTHALMIC REACTION OBTAINED WITH BOVO-TUBERCULIN D (MERCK).

By Veterinary-Surgeon ABEL-GRABEN,
Baden.

Indexed B. A. I.

Translated and Note added by Professor A. Wilson, Edinburgh, from *Berliner Tierärztliche Wochenschrift*, April 6, 1911, pp. 236, 237.

For the diagnosis of tuberculosis in cattle, veterinary surgeons have hitherto had to rely upon the reaction of the animals after the injection of Koch's tuberculin. The results obtained in this way were not always reliable, yet the method could not be abandoned in spite of its deficiencies, inasmuch as its utility was established as a fact (stood unquestioned).

In the tuberculin method, the complicated technique, particularly the registering of the temperature, the impossibility of applying the test to feverish animals, or of repeating it within a certain fixed period, all had a disturbing effect. The last-mentioned disadvantage even gave opportunities for fraudulent manipulations.

To avoid the necessity for the constant attendance of the veterinary surgeon to register the temperature, various ways of fixing the thermometer in the rectum of inoculated animals were tried. These, however, also had their disadvantages, which prevented them from coming into general use. It follows that veterinary surgeons would gladly welcome a more perfect method for the timely recognition of tuberculosis.

This method, I venture to think, has been found in the Ophthalmic Reaction, if the experimenters employing it more extensively should obtain the same results as myself, in which I came to the same conclusion as Garth of Darmstadt.

In this test, it is immaterial whether the animals are free from fever or not; the inconvenient taking of the temperature is not necessary, and the operation can be repeated at any time.

The importance of the matter induced me to take every opportunity of carrying out the test. That is not so easy for the practical veterinarian, inasmuch as it is not sufficient to observe the rise and fall of the reaction; the control in a slaughtered animal is also necessary.

I made use of the bovo-tuberculin D, as recommended by Garth.

The chemical manufactory of Merck at Darmstadt very kindly placed the material for my inoculations at my disposal, for which I desire here to express my best thanks.

The bovo-tuberculin D is obtained from pure cultures of tubercle bacilli, and represents the tuberculous toxin unaltered as to quality; it contains the poisonous matters of the culture-fluid, as well as those of the bacterial cells, in the most concentrated form. This preparation is equal to tuberculin E plus tuberculin F. Tuberculin E is the component obtained from the bacterial bodies, whilst tuberculin F is the part recovered from the culture-fluid.

The installation was carried out with Hauptner's 1-gram inoculation syringe.

I desire to call special attention to the advantage gained by placing the inoculated animals in such a way that an eventual licking off of the secretion by neighbouring animals is impossible.

Signs of irritation, *e.g.*, rubbing of the inoculated animals, have never been observed by me.

The positive reaction, it is well known, consists in the appearance of pus in the conjunctival sac of the inoculated eye; and decidedly pus, not merely a serous fluid.

I publish my experiments in order to increase the interest of veterinary surgeons in the matter. In the following I enumerate my experiments in chronological succession :—

Case I.—Cow, under veterinary treatment for chronic metritis and chronic diarrhœa. The former disease was the result of a difficult parturition in the preceding year. In the extraction of the calf carried out by a non-professional man, extensive wounding of the vagina and uterine cervix, with retention of the placenta, occurred. Recovery was incomplete inasmuch as a permanent discharge remained from the open cervix.

Latterly, the animal began to emaciate and slaughter was decided on.

The owner allowed me to inoculate with tuberculin. No reaction occurred.

The cow was seen to be free from tuberculosis after slaughter, *i.e.*, tuberculous changes could not be demonstrated in any organ or lymphatic gland.

Case II.—Cow, known to me about a year, has had a cough during this time, emaciated lately. Clinical diagnosis: Pulmonary tuberculosis. Inoculated. On the following day, at the eighteenth

hour, a decidedly purulent discharge was seen in the instilled eye, so that purulent matter covered the skin below the inner canthus. There was a typical reaction, which disappeared on the following day. Pulmonary tuberculosis in an advanced stage was demonstrated at the post-mortem.

Case III.—Cow, suffered about three months ago from decubitus, rose again after five days, appeared to recover, and calved normally, four weeks later.

Recently, emaciation, poor appetite, weakness in progression. Inoculated, sixteen hours after the inoculation, a pus concretion the size of a pea showed itself in the inner canthus of the treated eye. On the following day, the eye was normal.

Cow, suffered from pulmonary tuberculosis, as was demonstrated after slaughter ; also from adhesive pleurisy and pericarditis.

The last condition, in the acute stage, might have been the cause of the decubitus.

Case IV.—Old cow, suffered from cough for a long time, feeding well ; condition fair. Recently, the cow gave birth to a very small calf, and gave hardly any milk. Inoculated, twenty hours later, a pea-sized pus concretion (showed) in the inner canthus.

Slaughter gave evidence of pulmonary tuberculosis.

Case V.—Cow, known to me for some considerable time ; suffered from chronic lameness, and was therefore going to be killed. At my suggestion, she was inoculated. No reaction. I was present at the *post mortem ;* no tuberculosis could be demonstrated.

Case VI.—Young cow ; was to be killed owing to sterility ; inoculated ; no reaction. I made the *post mortem*, which showed no tuberculosis.

Case VII.—Analogous to Case 6.

Case VIII.—Fat cow ; owner wished to know if he could sell the animal with a warranty without scruple. Inoculated at my suggestion. No reaction. I was present when she was killed. No tuberculosis.

Case IX.—Cow, under treatment for cough, bad appetite, and emaciation. Fever up to 39·7C. Clinical diagnosis : tuberculosis. Inoculated, on the following day, twenty hours after the installation, a purulent discharge (appeared), which increased so much during the succeeding hours, that the skin under the treated eye was covered with pus.

Slaughtered. Tuberculosis of the lungs and liver.

Case X.—Cow, under treatment for cough, emaciation, arrest

of milk-secretion. Clinical diagnosis : Tuberculosis. Inoculated and reacted as marked Case 9.

Slaughtered. Tuberculosis of the lungs, liver, intestines, ovaries, Fallopian tubes, and uterus.

Case XI.—Cow, extremely emaciated, chronic diarrhœa. Inoculated. On the following day purulent discharge from the inoculated eye. Slaughtering showed the existence of pulmonary tuberculosis.

Case XII.—Old cow, coughs, losing condition. Clinical diagnosis : Tuberculosis. Inoculated. On the following day, collections of pus, the size of a pea, in the inner canthus. *Post-mortem :* Pulmonary tuberculosis.

Case XIII.—Young cow, much emaciated, cough. Clinical diagnosis : Tuberculosis. Inoculated. On the following day, profuse, purulent discharge from the treated eye. During the examination, the owner stated that the discharge would have been still more profuse had not the next cow licked a portion of it off. Slaughtered. Pulmonary tuberculosis.

Case XIV.—Ox, intended for the butcher. Inoculated at the owner's wish ; no reaction. No tuberculosis when slaughtered.

In all reacting animals the normal condition was restored forty-eight hours after the instillation. Secondary phenomena were not observed.

The reliability of the test has been demonstrated uniformly in all cases observed by me. All reacting animals have been diseased, as the *post-mortem* conditions have shown.

Six animals did not react, and they were found to be free from tuberculosis after slaughter.

On the strength of these results, I do not hesitate to endorse Garth's opinion, and consider the conjunctival-reaction produced by bovo-tuberculin D as a more useful means of diagnosing tuberculosis than the subcutaneous injections of Koch's tuberculin.

[*Translator's Note.*]—The author of the above article, in the translator's opinion, takes an altogether too optimistic view of the ophthalmic tuberculin test. Some extensive trials in this country have assigned it an important place as a useful auxiliary diagnostic agent ; but few, if any, British veterinarians hold that it approaches, equals, or surpasses the classic subcutaneous test in reliability. From 5 to 15 per cent. of cattle which react at one time or another to the general test fail to give a conjunctival result to one or several instillations in the same or in the control eye. Neverthe-

less, when the opportunity has arisen to make a *post-mortem* examination, tuberculous lesions have, as a rule, been in evidence.

The ophthalmic method is undoubtedly very convenient for the preliminary weeding-out of tuberculous subjects from a herd out of doors, fevered or freshly travelled animals.

It cannot, however, at the present time take the place of the hypodermic method, with which it is advantageously combined.

Details are given of fourteen cases, of which six were negative, and eight positive, the test agreeing with the *post-mortem* appearances in every instance.

The autopsies increase the value of the experiment very considerably. The author, however, seems to rely entirely on the presence or absence of pus in the sac or on the face at the inner canthus ; at any rate, other phenomena are not mentioned ; while in every reacting animal (some of them apparently marked) there was a return to normal in forty-eight hours.

Our usual experience is that a marked reaction may persist for a longer time. [A. W.]

THE FORMATION OF HYDROCYANIC ACID FROM LINSEED CAKE.*

By G. D. LANDER, D.Sc., F.I.C.,

Professor in the Royal Veterinary College, London.

Indexed B. A. I.

The occurrence of cyanogenetic glucosides in linseed has been long known, and the work of Dunstan and Henry (*Proceedings of the Royal Society*, B. 78, 1906, 145) established the identity of this substance with phaseolunatin, the glucoside of Java beans. The linseed contains the same enzyme, capable of resolving the glucoside, which is also chemically resolved by 10 per cent. hydrochloric acid.

Regarding the occurrence in linseed cakes, the same authors (*Journal of the Board of Agriculture*, March 1908, 729) quote two commercial cakes which gave total hydrocyanic acid 0·035 and 0·041 per cent. respectively. But they clearly emphasize the important question of "availability" of the poison, showing that no acid is formed on maceration with cold water, the enzyme having been, presumably, destroyed by the heating during process of manufacture.

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* From the *Journal of the Board of Agriculture.*

With such cake there can hardly be any question of poisoning, since there is no evidence to show that the glucoside is poisonous, or that it is resolved by digestive ferments or those contained in other foods.

Cakes are, however, often met with which yield "available" hydrocyanic acid, by which it is to be clearly understood that maceration with cold water produces free hydrocyanic acid. In such instances it is probable that part of the original enzyme has escaped destruction by heat. It has been found that fermentation goes on in 1 per cent. hydrochloric acid and also in 1 per cent. sodium bicarbonate solutions, and would not therefore be inhibited by the body fluids. The development of acid is, moreover, complete on twelve hours' digestion in water at 12° C. None of the cakes examined here contained more than 0·025 per cent. of available acid. Dr. Voelcker has kindly informed me of several cakes examined by him of which the lowest gave 0·0046 per cent. or 0·321 grains per pound, the highest 0·051 per cent., or 3·57 grain per pound. My own specimens averaged 0·025 per cent. Dr. Voelcker's 0·051 per cent. sample was a Calcutta cake, and he was informed that sheep refused it, unless kept without other food.*

The maximum noted by Dunstan and Henry (*loc. cit.*) for Java beans is 0·123 per cent., and it might therefore, bearing in mind the fairly rapid evolution of acid, be anticipated that linseed cakes, especially such as the one noted by Dr. Voelcker, might prove injurious, possibly even fatal. Taking cake of 0·025 per cent. hydrocyanic acid, a daily ration of 1 lb. for a sheep means a daily dose of 1·75 grains of acid, slowly evolved during digestion. A 2-lb. ration for a heifer would represent 3·5 grains of acid per diem. The medicinal doses are for the sheep $\frac{1}{3}$, for the horse or ox $\frac{1}{8}$ grain.

By the courtesy of Colonel Duncombe and Mr. E. G. Haskell, M.R.C.V.S., we were able to carry out feeding tests on sheep and on a heifer, which had for their primary object the elucidation of obscure cases of blindness affecting heifers. Incidentally, it was hoped to solve the question of the harmfulness or otherwise of the cake.

The results are here briefly summarized (HCN = Hydrocyanic acid) :—

(1) A sheep had 1 lb. cake (0·025 per cent. HCN) per diem for 36 consecutive days. No result.

* See also *Journ. R.A.S.E.*, 1909, p. 342.

(2) A sheep had 1 lb. for 31 days ; 5 lb. for 2 days ; and after 7 days a further 5 lb. No result.

(3) A heifer (six months) had :—

1 lb. per day dry cake for 4 days.
1 lb. per day moist cake for 13 days.
2 lb. per day moist cake for 2 days.
5 lb. per day moist cake for 18 days.

Fourteen days interval.

5 lb. per day moist cake for 30 days.

Total 261 lb. cake in 67 days equal to 456·75 grains of hydrocyanic acid.

No definite results having been obtained, the cake was discontinued, and after about six weeks acid in the form of pure potassium cyanide (KCN) was fed as follows :—

KCN equiv. to 3·5 grains HCN in ordinary food 4 days.
KCN equiv. to 7·0 grains HCN in ordinary food 1 day.
KCN equiv. to 10·0 grains HCN in ordinary food 1 day.

Interval 2 days.

KCN equiv. to 15·0 grains HCN in ordinary food 2 days.

Total 61·0 grains HCN in 10 days.

No obvious results were got. The animal at first refused the larger doses, but ate the food within an hour.

Fifteen grains hydrocyanic acid were then fed with 7 lb. of bran in one feed, and next day a further 15 grains, in this case liberated from the salt by an equivalent amount of dilute hydrochloric acid. No notable result was got.

After eight days, cyanide equivalent to 22·5 grains hydrocyanic acid were given in a gentian ball inserted into the rumen, and as no notable result ensued next day 30 grains were similarly administered. This proved fatal within two hours.

From these observations it may be concluded that cake such as that used is harmless. Variation due to idiosyncrasy is possible, and a cake of 0·05 per cent. would in an 8-lb. feed give 28 grains of prussic acid, equal to a 4-lb. feed of Java beans showing 0·1 per cent. acid.

There seems no ground to suppose that hydrocyanic acid is cumulative. Indeed, for a poison so volatile and easily eliminated this would not be anticipated. Similarly when gradually developed hydrocyanic acid could probably be taken in larger quantities than would kill in one dose. The general evidence of our experiments

is against the supposition that tolerance or habituation is established, but one cannot regard this as definitely negatived.

Poisoning by giving linseed has been known and recorded, and our results cannot be taken as absolutely exclusive of the possibility with cakes, especially with sheep. In this connection a test on sheep with a 0·05 per cent. cake and a determination of the toxic dose of the pure drug would be most desirable.

BOVINE PYELO-NEPHRITIS IN VICTORIA DUE TO A BACILLUS DISTINCT FROM THE BACILLUS OF ENDERLEN.

By J. A. GILRUTH, D.V.Sc., M.R.C.V.S., F.R.S.E.
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Indexed B. A. I.

This disease is well known to continental veterinarians, but so far as I am aware has not heretofore been recognized or at least recorded as existing in Australia.

That, however, it cannot be very uncommon is proved by the fact that it is occasionally seen in cows slaughtered in good or fair condition at the Melbourne City Abattoir. During the past year three cases have been brought under my notice by the Director, Mr. John Robertson. Unfortunately the first two specimens had been kept too long for satisfactory bacteriological examination—the photograph of one is reproduced showing the extensive nature of the disease—but in the last instance they were fresh.

The disease, especially in European countries, has been frequently recorded. It gives rise to fairly definite symptoms, such as irregularity of appetite and rumination and progressive cachexia, although the temperature remains normal, and the milk secretion is but little altered. In the later stages, there is frequent urination, the urine being turbid, and brownish or reddish in colour, with whitish flocculi. Colicky pains appear intermittently; pressure over the flank shows tenderness; while rectal examination may give definite indications of renal abnormality.

The causal organism of pyelo-nephritis is generally conceded to be the bacillus first isolated and described by Enderlen in 1891, termed the *B. nephritidis bovis*, or the coryne-bacterium,

a non-motile Gram-positive organism growing readily on artificial media, but not on potato, not curdling milk, and non-pathogenic to laboratory animals, or even to bovines when introduced into the subcutaneous tissues.

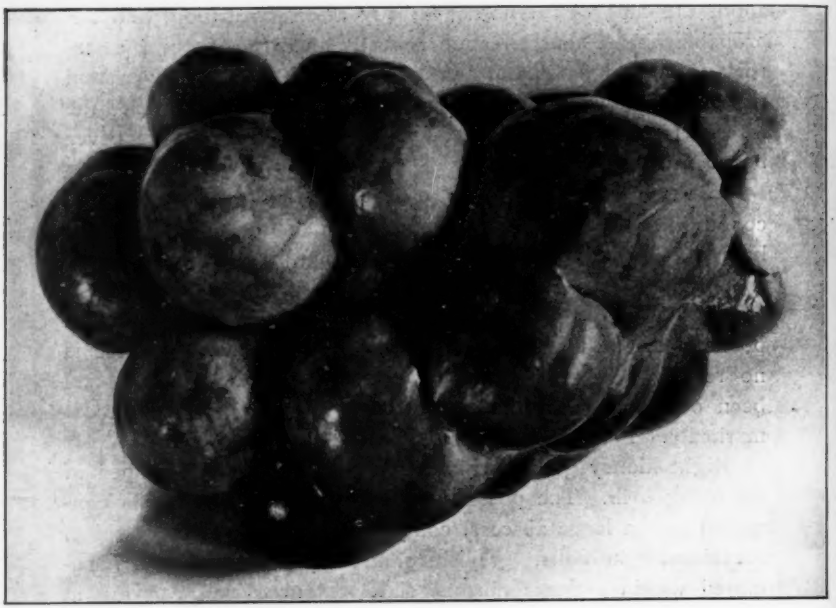
Although experiments have failed to reproduce the renal disease, its almost constant presence often in a state of purity in the lesions of bovine pyelo-nephritis, leads to the conclusion that it is the specific cause of the disease as a rule in Europe. Clinical evidence points strongly to the occurrence of infection about the time of calving or shortly after parturition, and the probabilities are that infection is really an extension of a catarrhal or other inflammatory process through the urinary system from the vulva. This is supported by the fact that the disease is unknown in males, and in females which have never borne calves.

In the case under review it was evident from the general condition of the carcase, and the amount of fat surrounding the kidneys, that but little general disturbance had accompanied the lesions: the animal had been purchased by a butcher in the ordinary way for beef purposes. Only the kidneys with small portions of the ureters had been retained for me, but there is no reason to believe that any other very evident lesions had been overlooked. Both kidneys were affected, the right most markedly. Following are the notes:—

Right kidney greatly enlarged, the weight when stripped of fat being 6 lb. The posterior two-thirds of the organ is converted into a large abscess, composed of about a pint of thick, tenacious, glutinous, greyish-coloured purulent material, enclosed within a dense fibrous, slatey-coloured wall, varying in thickness from ½ in. to 1 in. The anterior third shows a large collection of similar pus within the pelvis: the apices are atrophied, and the medulla infiltrated with pus, the cortex being congested and much denser than normal. The ureter is greatly thickened, being ¾ in. in diameter, and containing similar purulent material to that observed within the kidney. Left kidney normal in size. Four abscesses varying in size from a marble to a large walnut present within the kidney substance; each cavity contains pus similar in character to that described and is surrounded by a thin fibrous wall. Only one of these abscesses communicated with the kidney pelvis, but this was probably of

recent occurrence as the ureter contains no purulent material although the walls are slightly thickened. That these abscesses are of some standing is evident by the presence of much calcareous material in two of them.

Microscopical examination of the purulent material showed a number of bacilli varying in length from a short ovoid organism the length double the breadth, many within polymorphs, which were more or less degenerated. The bacilli had not the



Pyelo-nephritis. ½ natural size.

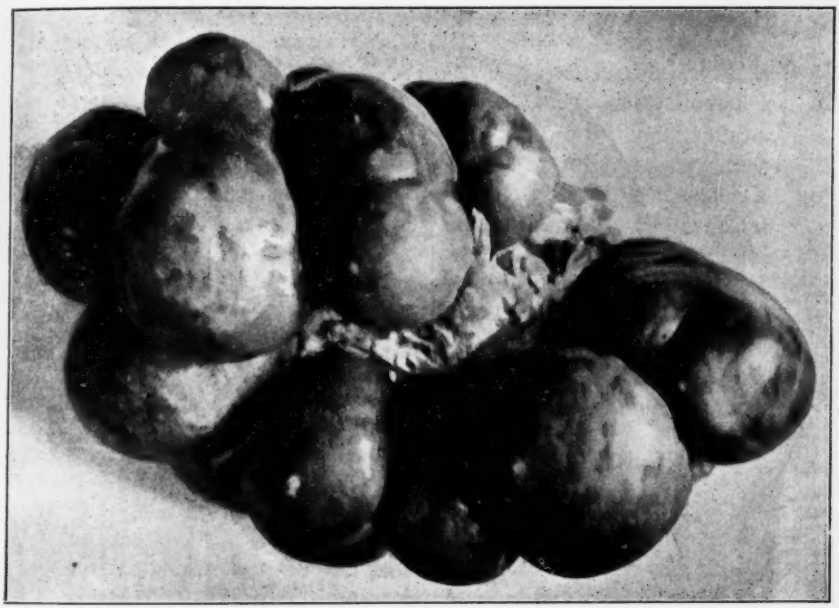
morphology ascribed to the coryne-bacterium, and were Gram negative, a number showing distinct bipolar staining.

Sections of the kidneys show chronic interstitial cirrhosis with distension of many of the descending tubules which contain hyaline casts and occasionally a few wandering cells, but no bacteria can be detected. Generally speaking the epithelium is but little altered, especially that of the convoluted tubules and the glomeruli, in spite of the great amount of new interstitial tissue present.

Agar and solidified serum slopes developed in twenty-four hours after inoculation at 37° C. almost pure cultures of bacilli morphologically similar to those observed on microscopical examination of the purulent semi-caseous material. Absolutely pure cultures were readily procured, and experiments on different animals were conducted with sub-cultures.

The following are the characters of the organisms:—

Bacillus, freely motile in young cultures, varying in size



Pyelo-nephritis. ½ natural size.

from almost a coccus to a bacillus 2 μ in length, breadth ·8 μ: stains readily by ordinary aniline dyes, but not by the method of Gram or its derivatives; frequently shows a bipolar staining; grows readily on all media, including potato, on which it develops as a thick, dirty, yellowish growth; does not liquefy gelatine; curdles milk slowly, having a definite digestive action on the clot; does not form gas or indol. It is fatal to guinea-pigs and rabbits, especially if young cultures are employed, but

produces no serious results if injected subcutaneously into bovines.

The cultural characters in detail are as follows:—

Agar and slope serum: colonies spherical, with smooth edges 2-5 mm. in diameter, creamy in colour. In streaks, thick, raised creamy growth with smooth edges.

Broth rapidly becomes cloudy with slight pellicle, and heavy deposit; bacilli in this medium at first actively motile, but in two or three days lose the motility, when the liquid rapidly clears.

Pyelo-nephritis. Section of kidney showing chronic interstitial cirrhosis. × 58.

Potato: thick yellowish white, dirty-looking thick growth, which does not increase after forty-eight hours.

Milk: curdled in forty-eight hours; clot thereafter slowly digested. Gelatine: in two to three days, at room temperature definite growth, somewhat translucent, with smooth edges; no liquefaction.

Experiments on Animals.

The following are the details:—

Rabbits.

Rabbit 21 inoculated with 1 c.c. twenty-four hours old subculture on broth (as used for guinea-pig 95) was found dead

twenty hours later. *Post-mortem* examination showed a large œdematous swelling distending the subcutaneous tissues of the inoculated limb (posterior) and along the abdomen. The swelling measured about 12 x 8 cm., and the œdema was semi-gelatinous: the muscles were pale and degenerated; internal organs normal. In the œdema many bacilli were present, and but few leucocytes. The blood was apparently sterile, but media inoculated developed colonies of typical bacilli in a state of purity.

Rabbit 35 was inoculated with 1 c.c. sub-culture in broth from rabbit 21 (as used for guinea-pig 121). In twenty-four hours the animal was ill, and showing considerable swelling of inoculated region. Death occurred in thirty-six hours, *post-mortem* examination disclosing simply a large œdematous swelling infiltrating the muscles and subcutaneous tissues of the inoculated limb; otherwise organs and tissues normal. Many bacilli with few leucocytes were found present in the œdema, and though the blood and organs were apparently sterile, media inoculated with the former developed numerous colonies of the bacilli.

Rabbit 37 inoculated with 0.5 c.c. first sub-culture from blood of rabbit 35 (as used for guinea-pig 140) was found dead eighteen hours later. *Post-mortem* examination showed much œdematous infiltration of the subcutaneous and muscular tissues of the inoculated region; otherwise there was no lesion.

Guinea-pigs.

Guinea-pig 86 inoculated with 1 c.c. five days' old sub-culture gradually developed a large firm dense swelling at the seat of inoculation, followed by a caseo-purulent abscess which ruptured on the twelfth day, this being followed by gradual healing. The characteristic bacilli were found present in the pus. On final slaughter of the animal some time later no secondary lesions were found.

Guinea-pig 95 inoculated with 1 c.c. twenty-four hours' old sub-culture in broth, also developed a large local abscess, which ruptured on the twelfth day. The animal, however, died on the fifteenth day. *Post-mortem* showed evidence of recent diarrhœa. A large irregular caseo-purulent mass extended forward along the subcutaneous tissue of the abdomen, thorax, and neck to the pharyngeal region. The internal organs were normal but

for a small caseous nodule the size of a pin-head in the spleen, and a fluid condition of the intestinal contents. Numerous bacilli were found in the caseo-purulent material, but the blood and internal organs were free, with the exception of the splenic nodule, which contained a few typical organisms.

Guinea-pig 121, inoculated with 1 c.c. second sub-culture of bacillus, recovered from rabbit 35, rapidly developed a large swelling, with great prostration and died in thirty-six hours. *Post-mortem* examination showed an acute inflammatory swelling with much œdema infiltrating the muscles at the seat of inoculation; otherwise there was no lesion.

Guinea-pig 140, inoculated with 0.5 c.c. first sub-culture from blood of rabbit 35, was found dead eighteen hours later. *Post-mortem* examination showed œdematous infiltration of the muscles and subcutaneous tissue at the seat of inoculation, but otherwise the tissues and organs were normal. Numerous bacilli were found present in the œdema of guinea-pigs 121 and 140, and that they were present in the blood and organs was proved by securing pure cultures on media inoculated therewith.

It is evident that passage of the bacillus through rabbits increases the virulence for guinea-pigs.

A cow in milk, but calved for some months, was treated by swabbing the vagina with a young virulent culture. A few days later a slight but distinct catarrhal condition of the vagina was observed and in this the characteristic bacilli were detected along with leucocytes and epithelial cells; but although this condition persisted for several days it was never marked and cleared up leaving the animal normal. When the animal was slaughtered some weeks later the kidneys and urinary tract were found normal.

Another cow injected subcutaneously with 1 c.c. culture, virulent for rabbits and guinea-pigs, remained normal beyond the development of a small firm swelling, which rapidly disappeared.

A calf 3 months old, inoculated subcutaneously with 1 c.c. virulent culture, the following day showed tenderness and diffuse swelling at the situation of the injection. The tenderness soon disappeared and in two days the swelling had become circumscribed and firm. Gradually this disappeared and left no trace.

The bacillus found practically in a state of purity within the purulent cavities of these kidneys is quite different to that

described as the usual cause of bovine pyelo-nephritis in European countries, as manifested by its motility, its ready growth on potato, staining reaction, &c. No organism corresponding to the coryne bacterium developed in any of the tubes of media inoculated with purulent material. Although experiments failed to induce the disease in bovines, the slight local reaction which followed its introduction subcutaneously and especially the definite though passing catarrh of the vagina, induced as a result of swabbing that canal with cultures, besides its virulence for rabbits and guinea-pigs, taken together with its presence in a state of practical purity in the renal lesions, forces one to the conclusion that it was the specific cause of the kidney lesions described.

It will be interesting to observe if examination of further cases in Australia, whether detected at abattoirs or in the field, leads to isolation of the same bacillus as described herein, or to the bacillus of Enderlen, as most frequently found in European cases.

At all events, seeing that such cases of pyelo-nephritis are occasionally found in cows slaughtered in good or fair condition for human consumption, and that the disease is often elsewhere the cause of definite symptoms and decided general disturbance, the possibility of its being a hitherto overlooked factor in otherwise obscure bovine complaints is well worthy of being borne in mind by practitioners.

A VARIETY OF THE VIBRION SEPTIQUE (BACILLUS OF MALIGNANT ŒDEMA), NON-PATHOGENIC FOR RABBITS.

By J. A. GILRUTH, D.V.Sc., M.R.C.V.S., F.R.S.E.,
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Indexed B. A. I.

The virulence of the Vibrion septique of Pasteur for the rabbit is usually considered of some importance, chiefly in its relation to blackleg, or symptomatic anthrax. It is generally agreed that the bacillus causing the disease malignant œdema is frequently found associated with the *Bacillus chauveaui*, the cause of blackleg, and because of this association of the two anaerobes, so similar to each other in their morphology and their pathological effects, the difficulty

of separating the two, and especially the difficulty experienced in securing a pure culture of the latter, is well appreciated.

That the bacillus of malignant œdema is pathogenic for rabbits as well as guinea-pigs, while the bacillus of Chauveau is pathogenic for the latter and not for the former, is often insisted upon, although Conn curiously enough includes rabbits along with guinea-pigs as susceptible to inoculation (*Agricultural Bacteriology*, Conn, 1909, p. 287). Muir and Ritchie ("Manual of Bacteriology," 1899, p. 401) state "Rabbits are practically immune to this disease (quarter-evil), while they are comparatively susceptible to malignant œdema."

Nocard and Leclainche write in regard to *B. chauveaui:* "le lapin est sur la limite de la réciptivité" ("Les Maladies Microbiennes des animaux," 1904, p. 417), and in regard to the Vibrion septique (p. 390), "parmi les petits animaux le cobaye et le rat blanc sont surtout sensible ; viennent ensuite le lapin, la poule," &c.

As a test for the freedom of the culture of *B. chauveaui* from Vibrion septique some insist upon the rabbit test, *e.g.*, Besson (*Technique microbiologique*, 1904, p. 311) counsels "Vérifier la culture par l'examen microscopique . . . et en inoculant un lapin et un cobaye, si le cobaye *suel est tué le virus est pur.*"

Such may be said to be the general experience of bacteriologists, though few would go so far as Friedberger and Fröhner ("Veterinary Pathology," authorised translation, 1908, Vol. 2, pp. 243-4), who recommend with suspected material, "in order to be able to positively distinguish between anthrax and quarter-evil (Rauschbrand) we should inoculate simultaneously a rabbit and a guinea-pig. If only the guinea-pig dies, the disease is quarter-evil ; if both die it is anthrax."

In spite of the general experience, however, that a race of Vibrion septique does exist which is non-virulent for rabbits, the observations I propose to record show.

The original material was received from Dr. Reakes, Chief of the Veterinary Department of New Zealand, and consisted of pipettes of blood and subcutaneous œdema of a guinea-pig which had been inoculated with fluid secured from a case of septic metritis in a cow. It is well known that although the bacillus of malignant œdema in artificial cultures has little or no pathogenicity for the bovine, yet it may be found as the causative agent of post-partum septicæmic metritis.

The following is Dr. Reakes' note of the bacillus :—

"Microscopic examination of the uterine fluid of these cases disclosed the presence of mixed organisms (but no streptococci), many of them appearing to be ordinary putrefactive organisms, others longer and thinner rods. Putrefactive organisms were also present in the blood, *post-mortem* having been made some twenty-four hours after death.

"In each case guinea-pigs were inoculated with the uterine fluid and with the blood; those receiving the uterine fluid died within twenty-four hours, considerable œdema being present at the seat of inoculation and extending right along from the thigh to the thorax. Those inoculated with the blood did not die; a considerable local swelling appearing at the seat of inoculation.

"In the œdematous fluid from the guinea-pigs inoculated with the uterine fluid only one organism (an anaerobe) was present, this being apparently the malignant œdema bacillus.

"No bacilli could be detected in the blood of the same guinea-pigs, but other guinea-pigs inoculated with blood from these died in less than twenty-four hours, showing œdema at the seat of inoculation, the same bacillus being found present.

"The pipettes I am sending are:—

"(1) Œdematous fluid from seat of inoculation from guinea-pig dead after inoculation with uterine fluid from cow.

"(2) Blood from same guinea-pig.

"The cases have interested me very much, and I am sure that they will interest you also, particularly as malignant œdema is not common among adult cattle. Indeed, I observe that Professor Law in his 'Veterinary Medicine' states definitely that the mature ox is immune, and by this I understand him to mean mature cattle of both sexes."

Examination of the œdema on receipt by me showed bacilli of irregular length, some involuted and degenerated, some sporulating, and a number of free spores. The blood contained bacilli of the same breadth, varying very much in length, but none sporulating, the absence of spores being the chief distinguishing character of this organism.

Attempts to grow these organisms aerobically failed, all media inoculated remaining sterile.

In serum broth media inoculated under oil with œdema, and with blood, rapid growth occurred. In tubes inoculated with œdema, there was cloudiness with much gas formation, with typical

odour and bacilli typical of the Vibrion septique of varying lengths, motile, some sporulating at ends, some in centres, and Gram positive, were to be seen apparently in a state of purity. In tubes inoculated with blood, there developed cloudiness but no gas formation, due to bacilli of varying length, motile, but non-sporulating, and Gram negative.

With each of these cultures a guinea-pig was inoculated, No. 31 receiving 0·25 c.c. of that from the œdema, and No. 32 0·25 c.c. of that from the blood. Guinea-pig 32 remained normal, and even developed no local swelling.

Guinea-pig 31 was found dead and cold sixteen hours after inoculation: *post-mortem* examination showed the typical lesions of malignant œdema—much sero-sanguineous effusion with gas formation and the typical odour, infiltrating the subcutaneous tissues of the inoculated limb, and floor of the abdomen; otherwise there being practically no change. Microscopical examination of this effusion showed numerous bacilli extremely variable in length (up to 15 μ), often in pairs, sometimes in short or long chains, few sporing, motile, and Gram positive. In the spleen and liver similar bacilli were very numerous. The blood appeared sterile, though after incubation of heart blood in pipettes typical bacilli developed in numbers.

Guinea-pigs (two) inoculated with 0·1 c.c. of œdema from the first guinea-pig also succumbed within sixteen hours, the *post-mortem* appearances being similar to those described.

A rabbit inoculated with 0·2 c.c. of the same culture as injected into the first guinea-pig remained unaffected.

Another rabbit inoculated with 0·25 c.c. of the ordinary contents of the original pipette sent by Dr. Reakes remained unaffected, and still another rabbit, inoculated with 0·25 μ first culture in serum broth inoculated with subcutaneous œdema from the second guinea-pig resisted completely.

It will be seen, therefore, that in spite of what is generally contended, a culture of the bacillus of Blackleg cannot necessarily be deemed free of the malignant œdema bacillus simply because it is not pathogenic for the rabbit.

Clinical Articles.

RUPTURE OF THE DIAPHRAGM AND STRANGULATED DIAPHRAGMATIC HERNIA.

By H. A. STEWART, Lieut., A.V.C.

Roberts' Heights, Transvaal.

Since true *ante-mortem* ruptures of the diaphragm are so rare, it is hoped the following short article will be of interest, chiefly on account of the absence of tympany and the fact that there was no history of an accident.

An Army Service Corps mule was admitted to the Station Veterinary Hospital on May 29 exhibiting ordinary symptoms of colic. The temperature was 102.2° F., pulse 62 and wiry to the touch, and the respirations 20 per minute. Tympany was very slight, and mucous membranes were injected. Borborygmi were, however, distinctly heard, and nothing very serious anticipated. *Treatment.*—Aloes ʒv. and chloral hydrate ʒi. was administered, the animal was back-raked, and a Reid's pump used for enemata. As pain was persistent, after two hours another ʒi. of chloral was given. After this the animal became quiet, and remained so throughout the following day. On May 30 the temperature had subsided to 100.5° F., fæces and urine were passed, and there was a general appearance of convalescence, except that a sloppy bran and linseed mash was refused, and the mucous membranes remained injected.

At 6.30 a.m. on the 31st the mule was apparently in the same condition, but about two hours later he lay down on the off side and expired in less than five minutes, without a struggle.

A *post-mortem* examination was held about an hour and a half after death, exhibiting the following lesions. There was slight peritonitis and a diffuse inflammation of the *intra-abdominal* viscera. Kidneys rather pale and friable in consistence, liver fatty and in a state of venous congestion. In the muscular portion of the diaphragm on the right side was a rupture 6 or 7 in. in extent through which protruded 14½ ft. of small intestine —into the thoracic cavity. This displaced portion of gut occupied the bulk of the thorax, was in a condition of acute strangulation, and except for some serous exudate empty. Both lungs

were congested, especially the right one—presumably hypostasis. There was a considerable amount of pleurisy. The right heart was filled with dark, tarry blood; left heart empty. This and the condition of the lungs points to asphyxia being the direct cause of death.

The notable feature in this case is the enormous length of displaced intestine.

IMPACTION OF THE INTESTINES, FOLLOWED BY THE PASSAGE OF AN INTESTINAL CAST EIGHTEEN INCHES LONG.

By Captain A. J. WILLIAMS, F.R.C.V.S., A.V.C.
Longmoor, Hants.

Subject.—A Mounted Infantry cob, aged 13 years.

History, &c.—October 3, 1910.—Admitted for treatment, being off feed, dull, blowing, temperature 101° F. Placed in loose box, rugged and bandaged, mash diet, stimulant given.

During the afternoon symptoms of subacute colic appeared. Chloral hydrate ½ oz. given.

October 4, 1910.—Subacute pain continues, tympany, rectum empty, case diagnosed as impaction of intestines. Aloes Bbd. 4 drachms, and chloral hydrate 4 drachms, given; enemas, abdominal massage.

October 5, 1910.—Much worse, conjunctivæ injected; constantly lying down and rolling; passes small quantities of urine at short intervals; catheter passed but no urine found at 3 p.m. Ammon. carb. ½ oz. and pulv. nucis vom. 2 drachms in bolus three times a day.

October 6, 1910.—Condition serious, pulse very fast and weak, refuses all food, a very small quantity of fæces passed, hard pellets, complete absence of borborygmi on the left side. 10 *a.m.*: Eserine 1 gr. and pilocarpine ½ gr. hypodermically; no result. Ammon. carb. 1 oz. and pulv. nucis vom. ½ oz., three times a day. Temperature, 6 *p.m.*, 102.8° F.

October 7, 1910.—Still in pain, temperature 101.6; pulse 48 and weak; continually up and down, but never violent; pain continues and subacute. 12.30 *p.m.*: Eserine 2 gr. and pilocarpine 1 gr. hypodermically with no result, continue ammon. carb. and pulv. nucis vom.

October 8, 1910.—Looks brighter, a little fæces passed, marked borborygmi on the right side, very slight on left, in less pain; continue ammon. carb. and pulv. nucis vom., enemas, abdominal massage.

October 9, 1910.—Standing quiet, head down, a little fæces passed containing a large proportion of undigested oats.

October 10, 1910.—Temperature 100, pulse weak, feeding a little, ol. lini. 1 pint, spts. ætheris nit. ½ oz. given; animal taken out for a short walk, stands quite quiet in the box.

October 11, 1910.—Relapse this morning, off feed, dull pain again, urine passed in small quantities and often. Aloes 5 drachms, in solution with tr. zingib. ½ oz., water 1 pint, given, enemas. 12.30 *p.m.*: Small quantity of soft fæces passed, animal quiet during the afternoon.

October 12, 1910.—In much pain, temperature 102, pulse 52 and very weak, conjunctivæ deeply congested. At 11.30 *a.m.*: barium chloride 10 gr. given intravenously in ½ drachm water; after twenty minutes animal in great pain, powerful tenesmus at frequent intervals causing partial eversion of the rectum, but no fæces passed. 2 *p.m.*: 1 oz. chloral hydrate given, which controlled the tenesmus. Animal in dull pain all the afternoon. 6 *p.m.*: Morphia injection given, 4 gr. morphia. 7 *p.m.*: Animal lying down and easy.

October 13, 1910.—Much brighter, passed a little watery ingesta, warm soapy enemas given, abdominal massage, linseed tea as a drench.

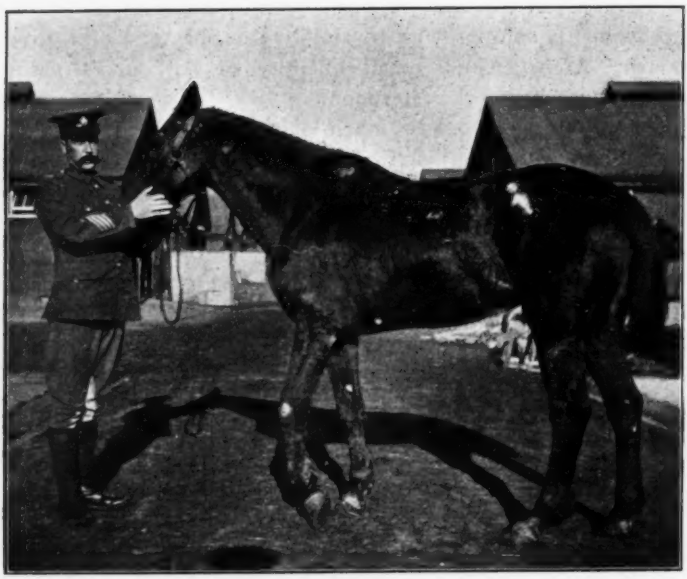
October 14, 1910.—Very dull again, a small quantity of pultaceous fæces passed, linseed tea, carrots, and a small quantity of green grass given.

October 15, 1910.—Still dull, but more borborygmi audible on left side, no fæces passed, urine passed in larger quantities and not so frequent.

October 16, 1910.—About the same; small quantity of fæces passed, tr. nucis vom., tr. gentian. co., spts. ætheris nit. 1 oz. each, and aqua 1 pint given.

October 17, 1910.—Eating a little mash, turned into paddock for a short time, grazes a little. Passed a shovelful of fæces, half of it blood-stained, the remainder normal in appearance, tinged green from the grass, animal very weak and dull; continue the medicine given on 16th, three times a day.

October 18, 1910.—At 8 *a.m.* the animal was standing in the box with head drooping, hanging from the rectum was seen a dark stringy mass about 2 ft. in length, a shovelful of greenish-coloured soft fæces was passed and the mass came away with it; upon examination it was found to be a cast of the intestines in a gangrenous condition. About half an hour later another quantity of fæces was passed, patient improved, pulse stronger and fuller, temperature 99.5, warm mashes with linseed, and steamed hay given, sent to graze for a short time in the morning, stimulants and tonics continued.



Photograph of patient showing lameness of near fore-limb on November 11, 1910.

October 19, 1910.—A quantity of fæces passed, eating mash well, animal very weak and tucked up; continue stimulants and tonics.

October 20, 1910.—Improvement maintained, large quantities of fæces passed.

October 25, 1910.—Fæces passed normal in quantity and appearance, animal still very weak.

October 30, 1910.—Animal bright and feeling well, noticed to be continually resting the near fore in a position similar to

that seen in a case of radial paralysis, and occasionally paws with the leg.

November 14, 1910.—Still rests near fore, pawing more persistent, carries limb.

November 23, 1910.—Marked atrophy of the anterior and posterior spinalis, spine of scapula and point of shoulder stands out prominently: evidently this condition is the result of an injury sustained when knocking about in the box during the periods of acute pain. *Treatment*: Massage and stimulating liniment, exercise. Bad bed-sores resulted from lying down and bruising when rolling; they are healing well.

November 30, 1910.—Much improved, trotting fairly well, atrophy still marked, general condition good considering the severity and length of the illness.

December 20, 1910.—Animal has suddenly gone lame on the off fore, symptoms same as seen in near fore; same treatment. Does not improve in condition, hide-bound and harsh coat; special diet: boiled food, &c., and tonics.

January 11, 1911.—Trotting nearly level, no sign of atrophy has appeared during the period of lameness on the off fore. Massage and exercise.

February 12, 1911.—Animal sound, condition much improved, discharged for a period of light work, then gradually brought into ordinary work.

REMARKS.

Intestinal cases often pull through in an extraordinary manner, this case appeared so hopeless at various stages that recovery seemed almost out of the question.

There was practically no action of the bowels for fourteen days, and during that period it was often difficult to know what line of treatment to adopt. I relied on the stimulating treatment and only gave barium chloride as a last resource, its action was so violent and ineffective that I should not use it again under similar circumstances.

The sudden lameness in the off fore was peculiar and unaccountable.

Recovery was perfect; the animal has been in regular work since March, carries good condition, and shows no signs of the severe illness.

The photograph shows the condition of the animal on November 11, 1910.

THE DIAGNOSIS OF BOWEL TROUBLES AS REGARDS ITS TERMINAL PORTION.

By G. MAYALL, M.R.C.V.S.
Bolton.

It has been stated by those inclined to take a somewhat pessimistic view of all our powers of diagnosis that as regards bowel affections everything may be put on a guess-work plane. In many cases, however, I think that a pretty sound diagnosis can be given as to the seat of trouble in stomach ailments of the horse, and as regards the rectum I am certain that such is the case, for what one can feel or touch certainly helps one. Quite recently I was called to a pony said to be affected with colic. On passing my hand into the rectum a rupture of its floor was at once detected. On July 19 I was called to a chestnut cart mare with colic. The usual anodyne draught was given and the rectum, greatly contracted, was explored. An enema was given but did not pass in any distance, in fact, about a quart of fluid was returned as fast as it was put in, indicating an obstruction not far from the anus. A diagnosis was given of strue or fæcal concretion close to the entrance of the rectum. The mare lived until June 23, and notwithstanding that the rectum was frequently explored and oleaginous enemas and draughts given, the obstruction did not come near enough to the hand to be removed. (I have previously removed concretions from rectum in two cases with happy results.) On *post mortem* a stone with a roughened surface was found just beyond reach of the hand. It measured half a foot through, was circular in form and weighed 6 lb.

I have noticed symptoms in two recent cases of peritonitis that do not appear to be mentioned in any text-book; in fact, peritonitis *per se* does not seem to be recognized as a disease of the horse in above one text-book. The symptom I refer to is alternate lifting of the hind legs and carrying them out so that if one stands near the hip of the patient one offers a good chance of getting kicked.

One of these cases followed an acute attack of lymphangitis and the other constipation (with colicky pains) and rubbing of salt on the vagina by a wiseacre.

FRACTURE OF THE TIBIA.

By W. CAUDWELL, F.R.C.V.S.
Chertsey, Surrey.

On Saturday morning last I was asked to examine a nag mare as to lameness. She had been driven two short journeys the same morning, and on returning home the second time she slipped on an iron inspection cover in the road, and suddenly fell lame on the near hind leg. I examined the limb and foot and could detect no evidence of pain or flinching except in the hock, which was the seat of a big old bone spavin. My advice was to place her in a loose box and apply hot fomentations to the hock. Slinging was impracticable, as she was heavy in foal and due to foal in three weeks hence. The following morning I received a telephone message asking me to see her again, as they thought her leg was broken. I found her lying down on the off side, and the deformity of the near hind limb at once indicated that a fracture of the tibia with displacement had occurred. The animal was forthwith destroyed. A *post-mortem* examination disclosed a comminuted fracture extending across the grooves and malleoli of the tibia, and half way up the shaft of the bone. Also an oblique fracture extending from the upper part of the ridge of the bone in an oblique direction downwards and backward, and some intermediate smaller fractures.

It appears probable that the fracture at its articulation with the astragalus happened when the mare slipped, on returning home, and that the other fractures and displacement occurred in lying down during the same night.

FRACTURE OF THE OS SUFFRAGINIS.

By Captain A. J. WILLIAMS, F.R.C.V.S., A.V.C.
Mounted Infantry School, Longmoor, Hants.

Subject.—M.I. cob, aged 10 years.

History, &c.—The cob was being ridden at a trot down a sandy lane, the groom felt the mare strike herself. She stumbled badly and almost came down; the groom jumped off at once and found the pastern broken.

The mare used to strike herself occasionally and go slightly

lame for a few strides. She was specially shod and was wearing brushing boots when the accident happened.

Post-mortem Appearances.—A comminuted fracture, the bone being broken into thirty pieces.

The pieces of the fractured os suffraginis.

It appears to have been split into several segments vertically, the posterior one being the largest.

The anterior segments were vertically cleft, also broken transversely into a large number of pieces of varying size.

A peculiar feature of the fracture is that whereas the posterior segment of bone is practically intact from top to bottom, the anterior part of the whole bone is split up into numerous pieces.

I am indebted to Major A. C. Newsome, A.V.C., Professor, Army Veterinary School, Aldershot, for the photograph.

THREE CASES OF ABNORMAL RETENTION OF THE FŒTUS.

By W. CAUDWELL, F.R.C.V.S.
Chertsey, Surrey.

Case 1.—On July 17, 1908, I was requested to examine a Jersey cow, which was due to calve a month previously. She was apparently in good health, but had not the appearance of an in-calf cow. No fœtus could be felt by external examination, and the os uteri, I found, was firmly closed. On examination per rectum I discovered that the uterus contained something hard. I advised that she should be kept under observation to notice whether she passed a fœtus.

On September 7 (about twelve weeks after the normal term of gestation had expired) the cowman noticed at 7 a.m. that she was uneasy, and straining a little, and a discharge escaped from the vagina. About five hours later she ejected two mummified fœtuses in their membranes. I advised that she should not be served again until three or four months had elapsed. That advice was acted upon, and about October, 1909, and again in 1910, she gave birth to a full-term heifer calf, and the cow and her progeny continue in good health.

Case 2.—On June 14, 1906, I was asked to attend a Jersey cow, 7 years old. She was straining frequently and severely, and passed thick mucus from the vagina. She was due to calve three months previously. External examination failed to detect a gravid uterus. Exploration per vaginam found the os uteri firmly closed, and no fœtus could be discovered. The pains gradually subsided under treatment, and in a few days ceased entirely.

On the 23rd of the same month she showed signs of œstrum, and was taken to and received the bull. The same afternoon

she expelled a mummified fœtus which evidently had been dead a long time.

I may add that about Christmas, 1905, when she was six months gone in calf, complaints were made about her milk having a bitter taste. Probably death of the fœtus had occurred prior to this and may have been responsible for the bad flavour of the milk.

Case 3.—An in-foal Shire mare, which was turned out in a meadow, having gone her full time showed signs of foaling and was brought into a loose-box, where she speedily gave birth to a fully developed dead foal. Coincident with this event, near a gate in the same meadow was found a small equine fœtus, which had apparently died about the seventh or eighth month of gestation. It is supposed that the mare had given birth to it also, as she was the only pregnant mare on the farm. About the end of the previous year the mare suffered slight colicky pains, so assuming that she was the parent of both, it seems probable that one fœtus died about that time and was retained the full term of gestation.

THE TREATMENT OF CONTAGIOUS GRANULAR VAGINITIS IN CATTLE.

By A. LASZLÓ.

Veterinary Surgeon, Füzesgyarmat, Hungary.

There is perhaps no disease of cattle which has caused such loss to the world as contagious granular vaginitis, and the abortion which used to follow it. It ruined the finest and the best herds, and experiments in the treatment and cure of the disease have not been very successful.

I have read most of the various remedies of this disease in English, German, and Hungarian veterinary literature, but none of them have shown such good results as the experiment which I have carried out with "Bissulin," made in Aachen, Germany, by H. Trommsdorff. "Bissulin," is a hydrargyrum preparation. It is made, for cows in the form of a cone, for bulls in the form of a stick.

I was called to a farm in the summer of 1909, where in a herd containing 95 cows and 3 bulls, 31 of the cows had aborted in four

weeks. The cause of the abortion seemed to be contagious granular vaginitis. The phenomena of the disease are well known, and I will not deal with them.

The whole herd was diseased. I treated the animals with lukewarm solutions of creolin 2 per cent. Irrigation was carried out once daily and after one week there seemed no improvement.

Then I commenced to treat the animals with "Bissulin." After having cleansed and disinfected the external genitals, tail and hindquarters, I irrigated the vagina with a solution of English creolin 1 per cent. After irrigation I rubbed the whole vaginal canal with a "Bissulin" cone; and I left what remained of the drug far in the vaginal tract. The bulls had "Bissulin" sticks applied to the penis. I did this during the first week once a day. During the second week I applied treatment once in two days. During the third and fourth week once in three days.

The result was, that the three bulls and six cows made no improvement, and they were thrown out of the breeding herd. In the vagina of the rest of the cows (89) there were no granules, nor was the bright red colour to be seen. After the fourth week each cow received four irrigations spread over a fortnight, and one "Bissulin" cone after every irrigation. Thus the cure takes altogether six weeks, with twenty "Bissulin" cones for every cow. As a result of this the contagious vaginitis was cured. The cows have copulated and after that have had no irritation. In the next year only four of the cows aborted. These were removed from the herd, and in the present year there has not been one abortion. I must not omit to mention that the most profound disinfection of the cowshed was carried out by me first of all.

In last March there was contagious vaginitis in another herd of 79 cows and 2 bulls. I threw out of the breeding 11 aborted and badly diseased cows and the 2 bulls. I treated the rest of the cows with the described method. Every one of them was cured and copulated. There is no irritation among them up to this day.

On account of the simplicity of the handling of the disease, and for the results which I have arrived at, and on account of the cheapness of "Bissulin," I offer it to my English confrères.

REMOVAL OF BOTH ABDOMINAL TESTICLES FROM A CRYPTORCHID THROUGH ONE INCISION.

By FREDERICK HOBDAY, F.R.C.V.S.
Kensington, W.

On May 4 last I was called in consultation by Messrs. Ross and Johnson, M.R.C.V.S., of Belfast, to operate upon a cryptorchid colt, 4 years old, neither of whose testicles had been removed. Nothing could be felt upon digital examination, either when the animal was cast or chloroformed, and the testicles were eventually found in the abdomen. The operation was performed in the usual way in the inguinal region, with the exception that upon gaining entrance into the abdomen through the left flank close to the inguinal canal I made a search for the right testis (after removing the left one) through the one incision I had just made. Upon passing my hand across the abdomen I found it without difficulty and upon attempting to withdraw it discovered that it had a sufficiently long spermatic cord to enable it to be brought sufficiently into view for the loop of the ecraseur chain to be placed over it. Removal was effected without difficulty, and the recovery of the patient uneventful.

The chief interest in the case lies in the fact of both testicles being able to be removed through the one incision, as such a course must of necessity, when able to be adopted, diminish the chances of wound infection.

At the same time the cord is usually so abnormally short that such a course is not possible, and although I have made the attempt on numerous occasions I have never before had the good fortune to be successful.

Canine Clinical Note.

A CASE OF HODGKINS' DISEASE.

By FREDERICK HOBDAY, F.R.C.V.S.,
Kensington, W.

The subject was a very small Japanese bitch, aged 5 years, which had been in the close possession of the owner as a great pet for about three years. About the middle of January the owner noticed that she occasionally had fits of weakness, especially after swallowing food, and in February the glands of the neck and just behind the angle of

the jaw were slightly swollen, but not at all painful. At the end of the month I was consulted and upon further examination of the body detected swellings in the glands of the groin and under the axillæ. There were now slight attacks of weakness and discomfort, and by the middle of March the glands had enlarged very considerably, averaging about the size of a Barcelona nut. Diagnosing the case as one of Hodgkins' disease, and therefore hopeless, I advised the owner to allow her to be painlessly put away.

This was done, and the body was sent to the Royal Veterinary College, where Sir John McFadyean made a *post-mortem* examination, and confirmed the diagnosis, stating that it was a typical case.

The rarity of this condition in canine patients makes the case worth recording.

WHITEWASH FOR COWSHEDS.

PART of the regular work on a dairy farm should be the periodical whitewashing of the cowsheds, pails, milkroom, &c., and the oftener this is done the better. The best and quickest way of applying the whitewash is by means of a spray pump, many of which can now be cheaply obtained. The following directions for preparing whitewash are taken from a bulletin of the Illinois Experiment Station: "Take a half-bushel unslaked lime of good quality, slake it with boiling water (cold will do), cover during the process to keep in steam, and add water as the process goes on. To do this the lime should be placed in a tight barrel and water enough added to partly cover the lime. Never cover the lime entirely with water, else the slaking process will go on too slowly. Soon after the water is added the lumps of lime, which are exposed to both air and water, begin to crumble, and soon the whole mass begins to steam. More water should be added, and the barrel kept covered. After the slaking process is over several pails of water should be added, and the whole thoroughly stirred. This mixture should be strained through a fine sieve before placing in the barrel to which the pump is attached, and, if necessary, more water may be added to secure a mixture which the nozzle will deliver well. The contents of the barrel or bucket must be kept well agitated, for the lime tends to settle upon the bottom. The spray must be fine and not allowed to play upon one place until the wash begins to run. When applied with brushes a slightly heavier wash can be used, as it is generally well rubbed down. Light coats frequently applied are better than heavy ones, as the latter are more apt to scale off. While still wet a light coat seems to have failed in its object, but when dry the whole becomes perfectly white. One bushel of lime will make 30 gallons of whitewash. Many formulas for making whitewash are published, involving the use of salt, oil, grease, rice, &c., together with the boiling of material at different stages of its preparation. These are too much involved for the ordinary man, besides taking too much time.

THE PRESIDENT OF THE NATIONAL VETERINARY ASSOCIATION.

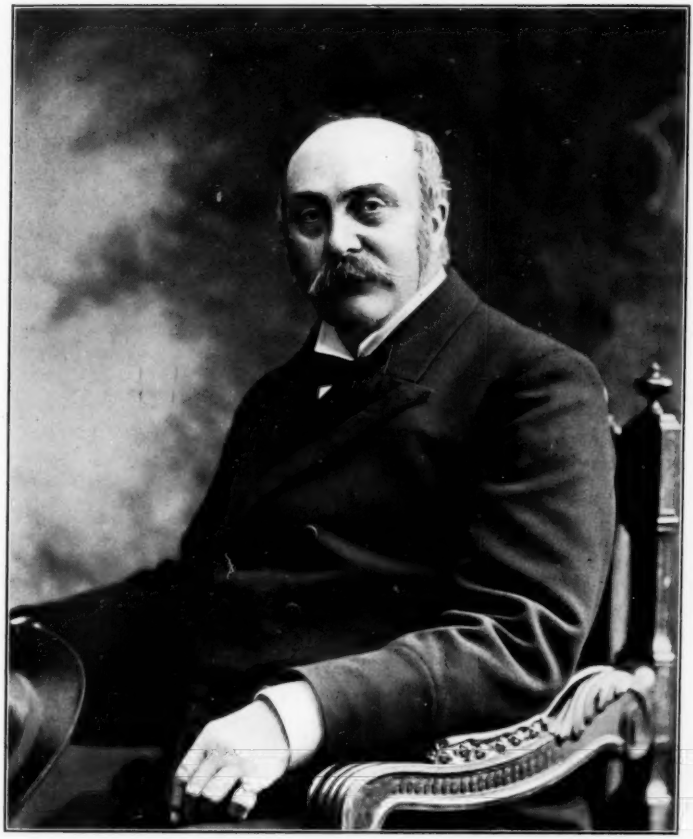
Thomas Salusbury Price, Esq., M.R.C.V.S.

We think we can say without fear of contradiction that there was never a more popular President of the National Veterinary Association than Mr. T. Salusbury Price, who has been engaged in presiding over this year's very important meetings. His genial presence and modest good humour are infective and it is always a great pleasure to be brought into contact with him. There is no doubt that his great success in his enormous London practice is largely due to these qualities, together with his conspicuous professional ability and tactfulness. Some men are born veterinary surgeons, and Mr. Price is one of them.

The President of the National Veterinary Association was the son of a veterinary surgeon, Thomas Salusbury Price, a Welshman, who was amongst the earliest of the graduates of the Camden Town school, and who over a century ago was granted a commission in the militia for the County of Carnarvon, in the time of His Majesty King George III, and subsequently fought in the battle of Waterloo. The warrant granting that commission is one of the President's most treasured possessions. Mr. Price was born in London, but spent much of his early boyhood in North Wales, and it is particularly fitting that he should be at the head of affairs the year the National meets at Carnarvon, since he springs from a Carnarvonshire stock.

Mr. Price studied at the Royal Veterinary College, London, and obtained his diploma in 1868, and settled down to practise in South London. In 1872 he married Emma, daughter of Robert and Emma Sabberton, of Cambridge. He became a member of the National in its earliest days and has been associated with it ever since, and he and Mrs. Price, who died in 1906, were constant in attendance at the annual functions. Mr. and Mrs. Price had three daughters, one of whom died young. The other two apparently would not forsake the profession in which they were practically reared, for they both married veterinary surgeons. One of these is the wife of Mr. Herbert King, who is a partner with his father-in-law. The other, a year or two ago, was married to Professor Wooldridge, of the Camden Town College, and is a regular visitor at the National.

Mr. Price, though still a busy practitioner, has found time to indulge in his hobby of farming, and he has a large model dairy farm in Surrey. (We wonder whether he makes it pay!) In addition he is one of those unassuming philanthropists who go about doing an enormous amount of good in a very quiet way. He is a life subscriber to the Victoria Veterinary Benevolent Fund, and has lately made additional donations to the fund. He is a regular contributor to numerous charitable institutions such as orphanages and the Royal Blind Pension Society,



MR. THOMAS SALUSBURY PRICE, M.R.C.V.S.
President of the National Veterinary Association, 1911.

and no deserving case of which he has any personal knowledge ever appeals to him in vain.

In matters veterinary he retains the liveliest interest. He was a conspicuous success as President of the Central Veterinary Society last year, and only a week or two ago he was announced by Sir John McFadyean as being one of those who had promised to give £100 to the fund for the entertainment of the International Veterinary Congress in 1914.

Abstracts.

ABSTRACT FROM THE FINAL REPORT OF THE ROYAL COMMISSION ON TUBERCULOSIS.

To The King's Most Excellent Majesty.—May it please your Majesty, we, your Majesty's Commissioners, appointed to inquire and report with respect to Tuberculosis :—(1) Whether the disease in animals and man is one and the same ; (2) Whether animals and man can be reciprocally infected with it ; (3) Under what conditions, if at all, the transmission of the disease from animals to man takes place, and what are the circumstances favourable or unfavourable to such transmission.

Three previous Reports have been issued by us. In the first (1904) the results of our preliminary investigations were discussed, and it was shown that the bacilli found in the lesions of certain cases of human tuberculosis produced in cattle a disease indistinguishable from bovine tuberculosis.

In our second Interim Report (1907) we dealt at some length with bovine and human tuberculosis and embodied in it the results obtained up to that date in the investigation of the characters of the bacillus of bovine tuberculosis and of the bacilli found in cases of human tuberculosis.

In the Third Interim Report (1909) we dealt with certain conditions of the tuberculous cow which rendered her milk infective.

Since the Second Report was presented we have continued our investigations into tuberculous disease of man and of the ox, and have also studied the tuberculosis which occurs in pigs, horses, some other mammals and birds. In this our final Report we propose to deal with the whole of our inquiry into the tuberculosis of all these various animals.

Our investigation has included the isolation of the bacilli from the lesions of the natural disease, the investigation of the cultural characters of the bacilli isolated and the study of their effects when introduced into different animals in varying doses and by several methods.

The species of animals used in this study have been cattle, rabbits, guinea-pigs, pigs, goats, chimpanzees, monkeys, horses, rats, mice, dogs, cats and birds. The experimental methods of infection employed have been subcutaneous, intravenous and intraperitoneal inoculation, and feeding. We have not attempted to infect by means of inhalation.

The experimental method of investigation we have adopted was essential in order to compare the characters of the bacilli isolated from the tuberculous lesions in different species of animals; without it we should not have been able to give any answer to the questions referred to us.

We have necessarily made ourselves acquainted with the results published from time to time by others engaged in the study and experimental investigation of tuberculosis, but the conclusions arrived at in this Report are based solely on our own researches.

Three Types of Tubercle Bacilli.

For purposes of description it is advantageous to distinguish three types of tubercle bacilli, recognisable by their individual characters. These are the human, bovine and avian types. The human type, although so named, is not the only one found in cases of tuberculosis in man. It is the organism present in the majority of such cases, but in some cases of the human disease the bacilli present are of the bovine type, and in others the bacilli have special characters distinguishing them from each of the three principal types. In natural cases of tuberculosis in cattle the only type of bacillus present is the bovine type.* Similarly, in cases of natural tuberculosis occurring in poultry the bacillus belongs to the avian type.

The relationship between these three types of tubercle bacilli will be the subject of discussion later in this report. At present only the individual characters of the three types will be described.

(A)—The Bovine Tubercle Bacillus.

It will be convenient to take the bacillus of bovine tuberculosis as a standard for comparison with the bacilli found in the tuberculosis of other animals. The characters and properties of this bacillus have already been discussed in the Second Interim Report (2nd Int. Rep., page 6 *et seq.*) and it is unnecessary here to repeat many of the facts there recorded. But a summary of its behaviour will facilitate comparisons to be instituted between it and the bacilli of the tuberculous lesions of animals other than the bovine.

(*a*) *Cultural Characters.*—The bovine tubercle bacillus grows slowly on serum and at the end of two or three weeks shows on the surface of the medium a thin greyish uniform growth, not wrinkled and not pigmented.

(*b*) *Effects on Animals.*—The bovine tubercle bacillus produces characteristic effects when inoculated in certain doses into calves and rabbits, and it is these effects, taken with its mode of growth in artificial cultivation, that enable it to be recognised as such.

In calves the subcutaneous injection under the skin of the neck of 50 milligrammes of a culture of bovine tubercle bacilli not older than three weeks produces generalised tuberculosis starting from the point

* In a calf inoculated subcutaneously with bacilli of the human type (H 79 JN), the avian bacillus was found in a nodule in a mesenteric gland. (Appendix Vol. I. Calf *1225*, p. 375.)

of inoculation and ending fatally usually within eight weeks. The local lesion is a mass of caseous tubercle, infiltrating the adjoining skin and muscle, and sometimes forming an abscess. The prescapular gland is a mass of caseous tubercle, as is also the prepectoral gland, and as are also to a less but variable extent the thoracic and mediastinal glands. Tubercles more or less caseous are found in very many, sometimes in all, the other lymphatic glands. The lungs, spleen, liver, and also the kidneys are studded with tubercles, many of them caseous. Tubercles are found in the pleura, on the omentum, on the peritoneal surface, and in the intestinal walls.

The injection of this dose of the bovine tubercle bacillus causes severe general tuberculosis in the calf, and it is the result in this sense which we have taken as a standard of virulence for comparison with that of the other bacilli investigated.

In rabbits generalised tuberculosis ending in death within five weeks resulted from the intravenous inoculation of 0·01 or 0·1 of a milligramme of culture of bovine tubercle bacilli. With intraperitoneal injection in doses of 0·1 and 1 milligramme the duration of life was from 13 to 48 days, and 10 to 38 days, according to the dose, but with subcutaneous inoculation of doses of 10 milligrammes and 1 milligramme the duration of life was longer—28 to 101 days, and 29 to 165 days, according to the dose.

The results produced by injecting the bovine tubercle bacillus into calves and rabbits in the above doses are thus very striking and definite, and taken with the cultural characters of the bacillus afford a trustworthy means of recognising the bovine tubercle bacillus. Indeed, as our investigation progressed we found that it was sufficient to inoculate rabbits for differential diagnosis ; for if an undetermined culture produces severe generalised disease in the rabbit within the period mentioned and by the doses referred to, administered in the various manners described, the same culture should produce an acute tuberculosis in the calf in doses of 50 milligrammes of culture subcutaneously inoculated.

Other properties of the bovine tubercle bacillus may be mentioned. It invariably produces acute tuberculosis in the chimpanzee, monkey and guinea-pig, by subcutaneous inoculation in very small doses. In the goat, pig and cat generalised tuberculosis is also readily induced by it. Indeed, the results of an adequate dose in the goat, pig and cat have an equal value with those obtained in calves and rabbits in differentiating the bovine tubercle bacillus from the tubercle bacillus found in other kinds of tuberculosis. The rat and mouse are highly resistant to the subcutaneous inoculation of the bovine tubercle bacillus, but after intraperitoneal inoculation the tendency is for the bacillus to multiply in the body and to be present in large numbers in the organs, even in the blood, without causing the formation of tuberculous lesions such as are produced in animals susceptible to the bovine tubercle bacillus. The dog is highly resistant to the subcutaneous inoculation of the bovine tubercle bacillus, but may succumb to general tuberculosis when large doses are inoculated intravenously or intraperitoneally.

In the fowl, the bovine tubercle bacillus injected intravenously causes death in about half the number of cases, usually with wasting

of the bird, œdema of the lungs and pallor of the liver. In some cases the lungs show definite tubercles and the liver shows minute necrotic areas. Death is apparently caused by the toxic effect of the bacilli, as dead tubercle bacilli intravenously injected will produce the same effects as living. When injected intraperitoneally or intramuscularly, even in large doses, bovine bacilli produce in fowls only a local lesion, without dissemination ot the disease.

In our experiments with horses the bovine tubercle bacillus in moderate doses did not produce progressive tuberculosis by subcutaneous inoculation or by feeding ; given intravenously in a dose of 10 milligrammes, it caused the death of the animal from acute tuberculosis in twenty days.

Stability in Culture.—We have not found that the bovine tubercle bacillus diminishes in virulence to any great extent when subcultured for long periods—in one instance for as long as 1487 days.

B.—Bacillus from Certain Cases of Tuberculosis in the Human Body.

The Human Tubercle Bacillus.

In our Second Interim Report (2nd Int. Rep., p. 14) we described the tubercle bacilli which we had found in cases of human tuberculosis and divided them into Groups (I, II, and III). Those belonging to Group I were proved to be identical with the bovine tubercle bacillus. The features of the bacilli of Group III were discussed, but final conclusions were not drawn by us regarding the significance of the somewhat anomalous results obtained. The bacilli of Group II had, however, definite characters and were obtained from the larger number of cases of human tuberculosis. This is the type of bacillus we have agreed to call the *human tubercle bacillus*, as it is the bacillus found in the majority of cases of human tuberculosis. What we stated in our Second Interim Report regarding this bacillus is confirmed by our further investigations. The chief characters of the bacillus are as follows :—

(*a*) *Cultural Characters.*—The human tubercle bacillus grows more rapidly than the bovine tubercle bacillus on serum, hence we have called it eugonic in contrast to the bovine bacillus, which is dysgonic. The growth tends to became wrinkled on glycerinated media, and becomes pigmented to a greater or less extent on all media.

(*b*) *Effects on Animals.*—It is in still greater contrast with the bovine tubercle bacillus when it is subjected to inoculation tests under the same conditions.

In calves, a subcutaneous inoculation of 50 milligrammes of a culture under three weeks old does not produce progressive tuberculosis in the animal, nor does it kill it. In the majority of instances the inoculation results in the formation of a local lesion, a larger or smaller mass, which may become a cyst, surrounded by a fibrous capsule : the lesion is thus retrogressive and localised. Lesions in the internal organs may occur, but these consist mainly of caseous or calcareous nodules in the lymphatic glands nearest the seat of inoculation, or of a few calcareous tubercles in various

internal organs. In about half the number of experiments performed with this bacillus in 50 milligramme doses on calves, tuberculous lesions did not extend beyond the nearest glands, no lesions being found in the spleen, liver, or kidneys. It is quite clear therefore, that the human tubercle bacillus possesses a much lower virulence for the calf than the bovine tubercle bacillus.

When inoculated into rabbits the contrast is also as a rule well-marked, so that, as previously stated, subject to certain precautions the rabbit test can be taken as a measure of virulence for calves ; that is, if a bacillus is found slightly virulent for the rabbit it will be found slightly virulent also for the calf.

The above statement may be taken as generally correct. It has, however, been noted by Dr. A. Stanley Griffith that in certain cases intravenous inoculation of 1 milligramme or 0.1 milligramme of a culture of the human tubercle bacillus produced in rabbits an acute and rapidly fatal tuberculosis indistinguishable from that which was caused by the bovine tubercle bacillus, but that death from tuberculosis never occurred within three months when 0.01 milligramme was used as a dose, whereas such a dose of the bovine tubercle bacillus invariably produced a rapidly fatal tuberculosis in the rabbit. Dr. Griffith would therefore conclude that for the purposes of distinguishing between the bovine tubercle bacillus and the human tubercle bacillus by means of intravenous inoculation in the rabbit a dose of 0.01 milligrammes should be used. With subcutaneous inoculation it was found that a dose of 10 milligrammes or more was a suitable one for the purposes of differential diagnosis. Such a dose of the bovine tubercle bacillus causes the death of the rabbit from acute generalized tuberculosis in 28 to 101 days, whereas with the human tubercle bacillus death does not occur from tuberculosis, and the animals have been killed in periods varying from 94 to 725 days.

The goat and the pig are not to any great extent affected by the human tubercle bacillus. In both animals the inoculation of this bacillus leads only to a slight retrogressive tuberculosis. Pigs perhaps are slightly more susceptible than calves. Acute tuberculosis is produced in the chimpanzee, monkey and guinea-pig by the human tubercle bacillus. The effect in the chimpanzee and monkey is similar to that which follows inoculation of like doses of the bovine tubercle bacillus. In the guinea-pig, however, the average duration of life is longer when the human tubercle bacillus is inoculated than after inoculation with the bovine tubercle bacillus. In the rat and mouse injected intraperitoneally with large doses of the human tubercle bacillus the bacilli become disseminated over the body, multiply in the tissues and cause death without producing characteristic tuberculous lesions. In the dog the human tubercle bacillus behaves like the bovine tubercle bacillus, that is, the animal is highly resistant to subcutaneous inoculation, but may die of generalized tuberculosis after intravenous or intraperitoneal inoculation of large doses.

The cat is resistant to the human tubercle bacillus when this is given subcutaneously, intraperitoneally, intramuscularly or by feeding. A few tuberculous lesions have been produced by intraperitoneal

inoculation, but these were not widely distributed and did not affect the health of the animal.

In the fowl the effect of the human tubercle bacillus is similar to that of the bovine bacillus. In one experiment in a horse, the subcutaneous injection of 50 milligrammes produced only local disease.

Thus the human tubercle bacillus is distinguished from the bovine tubercle bacillus by its more ready growth on artificial media and by the results of its inoculation into rabbits, calves, cats, pigs and goats.

But both the bovine tubercle bacillus and the human tubercle bacillus are alike in that they readily produce tuberculosis in chimpanzees, monkeys and guinea-pigs, and in the circumstance that the lesions produced in these animals are the same in distribution and structure.

Stability in Culture.—The human tubercle bacillus has not shown any alteration in cultural characters on prolonged subcultivation.

C.—The Bacillus of Avian Tuberculosis.

Avian tuberculosis, as it occurs naturally in birds, is discussed in a separate section. In this place an account is given of the characters and properties of the avian tubercle bacillus as exhibited under experimental conditions for comparison with those of the bovine tubercle bacillus and the human tubercle bacillus.

(a) *Cultural Characters.*—The avian tubercle bacillus forms a slimy whitish growth, which is easily emulsified, thus contrasting with the growth of bovine and human tubercle bacilli. It grows especially well on glycerinated media.

(b) *Effects on Animals.*—The results of the inoculation of the avian tubercle bacillus into animals are in marked contrast with those obtained from inoculation of the bovine and the human tubercle bacillus.

Fowls are very susceptible to the action of the avian tubercle bacillus by intravenous, subcutaneous, and intramuscular inoculation, and by feeding. After inoculation there are tuberculous lesions in the spleen and liver, and frequently in the lungs, cervical glands, muscles, and bones. After feeding, the distribution of the lesions is the same, with the exception that characteristic tuberculous lesions are produced in the mucous membrane of the intestines.

The lesions produced by the avian tubercle bacillus in parrots do not differ from those produced in fowls ; but the avian bacillus, when introduced by feeding, does not cause lesions in the intestines of parrots so constantly as in fowls. Parrots are susceptible to the action of both the bovine and human tubercle bacillus, and when either of these is given by inoculation or by feeding the lesions set up are similar to those produced by the avian bacillus, the bovine tubercle bacillus being apparently more virulent for these birds than either the human or the avian tubercle bacillus.

The rabbit and mouse are the only two mammals in which the avian tubercle bacillus causes progressive tuberculosis.

In the mouse, a generalised tuberculosis is produced by the avian bacillus, whether this is inoculated subcutaneously or intraperitoneally or is given by feeding.

The calf, pig, monkey, guinea-pig, horse, cat, and rat behave alike to the avian bacillus, which in them never produces a progressive tuberculosis, though it sometimes multiplies in the body and becomes disseminated in the tissues and may kill if a large dose is given intravenously. The adult goat reacts similarly, resisting subcutaneous inoculation and feeding, although it succumbs to the effects of intravenous injection of the bacilli. Young goats are rather more susceptible than adults. The chimpanzee, in the single experiment performed, was found to resist a large dose (50 milligrammes of culture) of the bacillus injected subcutaneously and no tuberculous lesion was found when the animal died three years afterwards. In the dog, large doses injected intravenously produce no effects.

Vitality in Culture.—The bacillus was found alive in culture after 1,067 days.

Chemical Properties of the Three Types of Tubercle Bacillus.

Dr. Harden was unable to detect any definite and constant biochemical character by which tubercle bacilli of one type can be differentiated from those of another.

Human Tuberculosis.

Cases of Human Tuberculosis other than Lupus.

Cases of Pulmonary Tuberculosis.—These fall into two series. In the first series (14 cases) a portion of the tuberculous lesion obtained at the *post-mortem* examination was used for investigation. In 13 of the cases this was the lung, in the other a bronchial gland only was used. In addition to the lung, a thoracic gland in one case, a cervical gland in a second case, a mesenteric gland in a third, and the spleen in a fourth, were investigated. These were clinically all cases of primary pulmonary tuberculosis, the disease which is commonly called consumption, in which the main and seemingly primary tuberculous lesion was in the lung, and in which death resulted from the pulmonary disease. In all these 14 cases the bacillus found was the human tubercle bacillus, and no evidence of the presence of the bovine tubercle bacillus was obtained.

The second series of cases included those in which sputum alone was examined. The sputum from 28 cases was used. The patients were usually young adults, and each case was investigated separately. To meet the possibility of the sputum being mixed with bovine bacilli derived from milk or butter the following precautions were taken :—Twenty-four hours before the collection of the samples of sputum the teeth and gums of the patient were carefully cleansed, and the mouth washed out repeatedly. Subsequently the patient was not allowed to take any milk or milk product until after the sputum had been collected. It was received directly into sterilized wide-mouthed bottles, and was then sent for investigation. Guinea-pigs were inoculated with the sputum and cultures obtained from

them. In two cases cultures were also obtained direct from the sputum.

The results of the investigation of these cases showed that the living tubercle bacilli present in the sputum in 26 cases were human, and in 2 cases were bovine. In none of the cases was there a mixture of bovine and human tubercle bacilli.

In three cases of *general tuberculosis*, the primary lesion of which could not be determined, and in three cases of *tuberculous meningitis*, in which the meninges and cerebro-spinal fluid were used for investigation, the lesions yielded human tubercle bacilli only.

Bronchial gland tuberculosis.—Five cases were examined. Three of these yielded human tubercle bacilli. Two others contained each a mixture of bovine tubercle bacilli and human tubercle bacilli. These two kinds of bacilli were separated and their characters investigated.

Nine cases of *cervical gland tuberculosis* in which the tubercle bacilli were obtained from specimens removed by operation were examined. Of these six yielded human tubercle bacilli and three bovine tubercle bacilli.

Primary abdominal tuberculosis, twenty-nine cases in all. Of these 14 yielded bovine tubercle bacilli, 13 human tubercle bacilli, and two cases were proved each to contain a mixture of bovine tubercle bacilli and human tubercle bacilli.

Of the total of 108 cases of human tuberculosis investigated 84 yielded human tubercle bacilli only, 19 yielded bovine tubercle bacilli only, and five both bovine and human tubercle bacilli. Although the bovine tubercle bacillus may, as it appears, be solely responsible for certain cases of pulmonary tuberculosis (consumption) and though it may be present with the human tubercle bacillus in the bronchial glands, it is evident from the data recorded that the majority of cases in which the bovine tubercle bacillus is the infective agent in the human being are cases of alimentary tuberculosis. Such are cases of cervical gland and primary abdominal tuberculosis. In the latter class of cases at least the tubercle bacillus has unquestionably been swallowed. Received in this way the tubercle bacillus, whether human or bovine, may pass through the pharyngeal or buccal mucous membrane and infect the cervical glands, or getting into the small intestine it may produce several different lesions such as ulceration of the gut, tuberculosis of the mesenteric glands attached and of the peritoneal covering. The percentage of these cases of alimentary tuberculosis due to the bovine tubercle bacillus is very large. Taking both classes of cases (cervical gland and abdominal) together, numbering 38, there are 17 in which the bovine bacillus alone was found, 19 in which the human bacillus alone was found, and two in which both were found. Taking the primary abdominal cases alone it is seen that in 16 out of 29 the bovine bacillus was found; in 14 of these it was the sole infective agent present.

Cases of Lupus.

Cases of lupus are considered separately from the other cases of human tuberculosis for the reason that they present certain divergent features of particular interest.

The cases of tuberculosis which have already been considered are those in which the disease affected the internal parts of the body; the internal organs, glands, joints or bone. In lupus the tuberculosis is usually limited to the skin. It runs as a rule a very chronic course, and is not commonly associated with internal tuberculosis. It may persist for many years without any sign of disease in the lungs or other parts of the body, and indeed even the lymphatic glands near the area of skin affected by lupus are not usually tuberculous.

The investigation was conducted with great care and completeness by Dr. A. Stanley Griffith. Twenty cases of lupus were examined.

In nine cases of lupus a bacillus was obtained presenting the cultural characters of the bovine tubercle bacillus. In only one case did the bacillus obtained from the original material possess the high virulent as well as the cultural characters of the bovine tubercle bacillus. The other eight viruses, though their bacilli exhibited and retained the cultural characters of the bovine tubercle bacillus, proved less virulent than that bacillus, not only for the calf and rabbit but also for the monkey and guinea-pig. It was found possible in two cases to increase the virulence of the culture from the original material by residence in the tissues of the calf and rabbit so as to bring it up to the high virulence of the bovine tubercle bacillus.

In eleven lupus viruses the original cultures manifested the cultural characters of the human tubercle bacillus. All these showed low virulence for the calf and rabbit, agreeing in this respect with the human type of the bacillus, though some of them exhibited for these animals much less virulence than that bacillus. They differed, too, from the human tubercle bacillus in that generally they had a lower, some of them a much lower virulence for the monkey and guinea-pig.

Swine Tuberculosis.

Tuberculosis is not an uncommon disease in swine, and the lesions from 63 individual cases were investigated. Four of these have to be excluded from consideration owing to the fact that cultures were not obtained. There remain 59 cases which were completely examined as regards the type of bacillus isolated from the lesions.

In swine the commonest method of infection is by ingestion of tuberculous material, and the parts first affected are the lymphatic glands in close relation to the alimentary tract (submaxillary, pharyngeal and mesenteric). The abdominal organs, especially the spleen, are not infrequently involved, and in many cases the organs of the thorax as well.

The specimens investigated were obtained in all cases from the slaughterhouse, and were taken from the carcases of animals sent there for the purpose of being slaughtered for food.

The cultures which were obtained from these were observed as to their mode of growth and were used for inoculation into guinea-pigs, rabbits, calves, fowls and other animals in order to determine the characters of the bacilli present, whether bovine, human, avian, or a mixture of these.

The results thus obtained are shown in the following table :—

Degree of Tuberculosis in the Pig	Bovine Virus	Human Virus	Avian Virus	Mixed Avian and Bovine	—
Local Tuberculosis ...	... 18 cases	... 3 cases	... 5 cases	... —	... 26
Generalized Tuberculosis	... 32 ,,	... —	... —	... 1 case	... 33
	50 cases	... 3 cases	... 5 cases	... 1 case	... 59

The results of our investigation of Swine Tuberculosis are clear, and may be summarized as follows :—

All three types of tubercle bacilli are capable of infecting the pig, but the human bacillus and the avian bacillus are less frequently found in this animal than the bovine bacillus. The bovine tubercle bacillus, though in many pigs it may have caused no more than a localized lesion in the submaxillary lymphatic glands at the time of slaughtering the animal, nevertheless in many instances produces a severe and generalized disease. One case of mixed infection with bovine and avian tubercle bacilli was met with and a mixed infection with human and bovine tubercle bacilli must be considered possible in the pig, although it was not found in any of the cases investigated by us.

Equine Tuberculosis.

In horses tuberculosis is in most cases primarily an affection of the glands and organs in connection with the alimentary tract, the abdominal organs being chiefly affected. Five cases of equine tuberculosis were investigated. In one there were tuberculous lesions in the mesenteric glands and spleen ; in a second case the mesenteric glands alone were affected ; in a third case the spleen was the only tuberculous organ ; and in two cases the mesenteric glands, spleen and lungs were affected, the disease having become generalized.

In three cases the material investigated was from the tuberculous mesenteric glands, in one case from the spleen, and in another case from the lungs, spleen and mesenteric gland.

In four cases the material was first injected into guinea-pigs and cultures were obtained from these animals ; in one instance, the culture was obtained direct from the original material. In all cases the cultures obtained grew like those of the bovine tubercle bacillus.

The results of the experiments performed in testing the potency of the bacilli of these equine viruses show that notwithstanding the similarity of their cultural behaviour their virulence is not in all cases parallel with that of the bovine bacillus.

On the whole the properties of these viruses more closely resembled those of bovine tubercle bacilli than those of the other two types of tubercle bacilli—the human and the avian.

Question of Modification of Bacilli.

In the front portion of this Report we have set out the special characters of the tubercle bacilli commonly found in bovine animals, man and birds, and for convenience in describing the results of our investigations we have termed them respectively the bovine, the

human, and the avian type of tubercle bacillus. The three types are to be distinguished from each other by their cultural characters and by the effects of their inoculation into various animals. Distinction cannot accurately be made between these types on the basis of microscopic character alone. Morphologically mammalian tubercle bacilli, from whatever source derived, are uniform in character when grown on serum. The microscopical characters of mammalian bacilli were described in our Second Interim Report, pp. 25 and 26.

Avian tubercle bacilli when grown on glycerin-serum are generally very short (·5 to 1μ) and rather thick, often looking like cocci. Other media commonly yield longer and more irregular forms ; and such forms are also sometimes found on glycerin-serum. Amongst these irregularities is found every counterpart to the irregularities observed amongst mammalian bacilli ; and, in addition, large club-shaped thickenings are common and branching occurs more frequently than with the mammalian bacillus. In films obtained from emulsions of cultures it is noticeable that avian bacilli are generally distributed ; they do not present the solid clumps of closely adherent bacilli which are characteristic of mammalian tubercle bacilli. When growing freely in the tissues the avian bacillus is short, straight, and uniformly stained ; when growing under difficulties it is longer and more irregularly stained, and is indistinguishable from mammalian bacilli growing under similar adverse conditions.

To the difficult question of fixity of type of bovine, of human and of avian bacilli, we have given much time and attention. There is here involved a problem of much complexity, the facts bearing on it being not only voluminous but in certain senses conflicting, and we have had to regard the problem broadly from two points of view.

First we have had to inquire :—

Whether *as regards naturally acquired tuberculosis* evidence is forthcoming of modification, in any sense great or small, in the ordinary animal body, of any particular type of tubercle bacillus—bovine, human or avian ?

And, *secondly* we have had to ask ourselves whether *under experimental conditions* any, and, if so what, modification can be induced, and in this connection we have experimented as follows :—

We have—

(*a*) Submitted the several types of bacillus to a series of cultural processes ;

(*b*) Submitted them to long sustained influence of the living tissues of the animal body.

These particular experiments (detailed in the Report) failed to effect any modification in the bovine or human tubercle bacillus.

As regards experiments directed to modify the virulence of the avian tubercle bacillus similar negative results were obtained.

In cases of internal human tuberculosis we found a certain number which showed a mixture of human and bovine tubercle bacilli, and in the pig there was one case in which there was a mixture of bovine and avian tubercle bacilli. When separated, the bacilli from these cases were found to correspond in their characters to the bovine, human and avian types. Although it might be urged that the mere finding of the two types in a lesion indicated the

occurrence of a process of modification in one or other type, yet we found no transitional types in the lesions of internal tuberculosis in the human being, nor in the pig any but doubtful suggestion of such transition. The only variations from the three types which we have found in our extended investigations have occurred in cases of lupus and in equine tuberculosis.

Consideration of the Results in Relation to the Terms of Reference.

The questions that were referred to us for investigation and report are as follows:

"Whether the disease in animals and man is one and the same?

Whether animals and man can be reciprocally infected with it.

Under what conditions, if at all, the transmission of the disease from animals to man takes place, and what are the circumstances favourable or unfavourable to such transmission?"

First Term of the Reference.

The first question is:—Whether tuberculosis in animals and man is one and the same?

We have always found that guinea-pigs, chimpanzees and monkeys are all highly susceptible to the effects of either the human or the bovine tubercle bacillus and that the disease produced in these animals by both types is histologically and anatomically identical.

Obviously it has not been permissible to induce tuberculous disease experimentally in the human subject by the injection of bovine tubercle bacilli, and no opportunity presented itself to us of examining any case of accidental infection in which the bovine tubercle bacillus entered the human body through the skin and set up a generalized disease. But we have investigated many instances of fatal tuberculosis in the human subject in which the disease was undoubtedly caused by a bacillus of the bovine type and by nothing else. We have compared the lesions from such cases with those obtained from parallel cases of fatal tuberculosis in which the human tubercle bacillus alone was discovered. Except for the difference in the type of bacillus found in them, these two groups of cases presented similar features; the clinical histories of the patients were alike, the cases all terminated fatally, and the lesions examined after death were found to be anatomically indistinguishable. Man must therefore be added to the list of animals notably susceptible to bovine tubercle bacilli.

Chief among the differences between bovine and human tubercle bacilli is, of course, difference of virulence towards certain animals. Why, it may be asked, is the human bacillus, though as virulent for the monkey and the guinea-pig as is the bovine, far less virulent than that bacillus for the calf, goat, and pig? Is the human bacillus a bovine bacillus which, through some cause or combination of causes, has become modified, and, if so, is its degradation in this sense permanent?

We have recorded our repeated attempts to transmute the bovine bacillus into the human bacillus, and *vice versa*. Most of these attempts failed altogether, a few only were equivocal; we found indeed that under the conditions contrived by us both types of bacilli remained remarkably stable, alike as regards their growth on artificial media and their virulence for animals. Thus, we are inclined to regard transmutation of bacillary type as exceedingly difficult if not impracticable of accomplishment by laboratory procedure, though in view of certain instances in which we obtained from one and the same human body both types of bacillus, we are not prepared to deny that the transmutation of one type into another may occur in Nature.

With respect to the question of the stability of the pathogenic properties which distinguish the two types, we must again refer to the exceptional characters possessed by certain of the bacilli which were isolated from cases of lupus and equine tuberculosis. In some of these cases the bacilli had the ordinary cultural characters of the bovine type, associated with a degree of virulence for the calf and rabbit no greater than is usually exhibited by the human type. We have already given reasons for declining to accept these exceptional bacilli as distinct fixed types, and if that view of them is excluded they must be regarded as either modified human or modified bovine bacilli. On the former assumption they had acquired the character of growth ordinarily exhibited by the bovine type, and on the latter assumption they had lost the higher degree of virulence for certain animals which is characteristic of the bovine type. The latter appears to be the more probable explanation, and if that view be accepted the discovery of these exceptional bacilli makes it impossible to regard difference of virulence for the calf and rabbit as sufficient to establish the non-identity of the human and the bovine types.

There would therefore remain only slight cultural differences on which to found the conclusion that the human and the bovine types represent two distinct organisms. We prefer to regard these two types as varieties of the same bacillus, and the lesions which they produce, whether in man or in other mammals, as manifestations of the same disease.

But while we regard the point which we have just considered as one concerning which there is room for difference of opinion, there is an aspect in which tuberculosis in men and in cattle must unquestionably be pronounced one and the same disease. Whether one prefers to regard bovine tuberculosis and the cases of tuberculosis in man which are caused by the human type of bacilli as varieties of the same disease or as independent diseases, there can be no question that human tuberculosis is in part identical with bovine tuberculosis. Our researches have proved that in a considerable proportion of cases of the human disease the lesions contain, and are caused by, bacilli which are in every respect indistinguishable from the bacilli which are the cause of tuberculosis in cattle. In all such cases the disease therefore is the same disease as bovine tuberculosis.

There remains the question whether avian tuberculosis and

bovine tuberculosis, or avian tuberculosis and the tuberculosis caused by the human type of bacillus, are one and the same disease. In this matter there does not appear to us to be in the present sufficient ground for answering the question in the affirmative.

Second Term of the Reference.

In the second term of our Reference we were asked :—Whether animals and man can be reciprocally infected with tuberculosis ; that is, whether the disease known as tuberculosis can be communicated direct from man to animals, and from animals to man ?

Taking the facts into consideration together with those others already discussed in relation to the first term of our reference, and excluding the fowl and other birds from further consideration in this connection, we must conclude that mammals and man can be reciprocally infected with the disease (tuberculosis). The possible danger to man through reciprocity in this sense was, of course, the more important question presented to us, and as we have conclusively shown that many cases of fatal tuberculosis in the human subject have been produced by the bacillus known to cause the disease in cattle, the possibility of such infection cannot be denied.

And the importance of this conclusion is not diminished by the fact that the majority of such cases examined by us occurred in young children, or by the merely local results following the administration of the human type of bacillus to bovine animals. Bovine animals are not completely immune to the human tubercle bacillus, and adult human beings can be infected with the bovine type, even the pulmonary form of the disease in man being sometimes caused by the bovine tubercle bacillus.

Third Term of the Reference.

The third question with which we are called upon to deal is :—Under what conditions, if at all, the transmission of tuberculosis from animals to man takes place, and what are the circumstances favourable or unfavourable to such transmission ?

Transmission of tuberculosis from animals to man must obviously be mainly dependent on the susceptibility of any given animal to this disease and on the opportunities afforded such animal for transferring its acquired and developed infection to the human subject. From what we have already said, man must clearly be regarded as being liable to risk of infection from at least two of the three types of tubercle bacilli, the human and the bovine. In this connection it will be convenient to discuss each type separately.

Avian Tuberculosis.—Prima facie, man might be regarded as at some risk from this form of tuberculosis owing to his food relations with fowls and certain other birds, and the fact that we have in more than one instance discovered the avian tubercle bacillus in the bodies of pigs might also be considered a matter of importance. But in no single instance have we found the avian tubercle bacillus in the lesions of tuberculosis in the human being, whilst man's comparatively near relative, the monkey, would appear from our experiments

to be highly resistant to tubercle bacilli of this type. The pig is the only mammal in which we have found the avian bacillus in the lesions of naturally acquired tuberculosis, but possible danger to man from this source would appear to depend on an ability not yet demonstrated of this animal to bring about modification or alteration of this type of tubercle bacillus in the direction of greatly enhancing its virulence for man. We must conclude, as the result of our investigations, that the unmodified avian tubercle bacillus is a negligible factor in the production of human tuberculosis.

Human Tuberculosis.—In so far as tuberculosis of this type in animals lower than man has resulted from infection contributed to them by man himself, man has been multiplying in bodies other than his own that type of tubercle bacillus to which he is seemingly most prone, and thus increasing his chances of death by tuberculosis. But, as has been shown, animals, domestic and other, which have been found capable of suffering from severe generalized tuberculosis of the human type are comparatively few ; and further, none of these active multipliers of human tubercle are common food animals. The bovine animal, for instance, is not an active multiplier of the human tubercle bacillus, being highly refractory to this infection ; and the cow herself, however prone she may be when the subject of bovine tuberculosis to excrete bovine bacilli in her milk, has never under natural conditions been convicted of eliminating in this way the human tubercle bacillus. Experimentally, it is true, the human bacillus has been made to appear in the milk of the cow and goat, but for securing this end very large doses of culture have been requisite. Probably only when the cow or goat has received a large dose of tuberculous material derived from man does the human tubercle bacillus escape into the blood-stream of the animal, reach her milk sinuses, and become eliminated with her milk.

Nevertheless, it is not to be affirmed with confidence that man is wholly free from risk through animal food of infection with that type of tubercle bacillus to which he appears most prone, though the degree of danger to him in this sense must remain for the present undetermined. The pig, though not capable in our experimental experience of fostering tubercle bacilli of the human type except in a minor degree, may have to be regarded as a possible source of the disease caused in man by that type of bacillus ; for the reason that particular glands of the pig's body, which are likely to enter into certain prepared foods, do on occasion yield tubercle bacilli of the human type.

Bovine Tuberculosis.—Before dealing with the conditions affecting the direct transmission of tuberculosis from bovine animals to man, one other potential source of infection of man with the bovine type of the tubercle bacillus must be referred to. The pig is, besides the bovine, the only animal commonly used for food by man in which during our investigation we have found the bovine tubercle bacillus producing the progressive lesions of the natural disease. We found this bacillus in a number of cases of swine tuberculosis sufficient to justify us in calling attention to the danger without entering into a discussion as to its extent. Bovine tubercle bacilli are infective to human beings, and we have no reason to suppose that they can be rendered less so by previous residence in the bodies of pigs.

During the course of our inquiry we investigated material obtained either *post mortem* or by operation from 146 individual cases of persons suffering from tuberculosis ; a total which does not include the two viruses consisting of sputum collected daily from a varying number of patients. But some of those 146 have been excluded from our final conclusions for reasons already set out on page 9, and certain others of them, though dealt with in detail in our Appendix, are not considered in this report, the investigations in which material from them was employed having but an indirect bearing on the terms of our reference. Thus the actual number of cases, representing the various clinical manifestations of tuberculosis commonly found in man, that have passed under strict observation and on which our conclusions are based, is 128.

So far as these 128 cases have been examples of tuberculosis in the adult, and especially when they have been cases of pulmonary tuberculosis, the lesions of the disease when fatal have been referable with few exceptions to human bacilli. Only rarely has a pulmonary lesion in adult man yielded the bovine bacillus. Our experience of abdominal tuberculosis in the human subject has been very different, especially as regards children. Of young children dying from primary abdominal tuberculosis, the fatal lesions could in nearly one-half of the cases be referred to the bovine bacillus, and to that type alone. In children, too, and often also in adolescents, suffering from cervical gland tuberculosis, a large proportion of the cases examined by us could be referred to the bovine tubercle bacillus. We have already in an earlier portion of this Report referred to the importance of infection by the bovine type of tubercle bacillus in cases of lupus occurring in adolescents and children.

Whatever, therefore, may be the animal source of tuberculosis in adolescents and in adult man, there can be no doubt that a considerable proportion of the tuberculosis affecting children is of bovine origin, more particularly that which affects primarily the abdominal organs and the cervical glands. And further, there can be no doubt that primary abdominal tuberculosis as well as tuberculosis of the cervical glands is commonly due to ingestion of tuberculous infective material.

Judging by our feeding experiments there would appear to be strong presumption that as regards most animals comparatively large doses given either singly or by frequent repetition are necessary to produce by ingestion acute progressive generalized tuberculosis, though we have recorded instances in which a very small dose administered but once has produced this result. Applying a like presumption to man (and our observations on the monkey and chimpanzee in this connection afford warrant for so doing) it may be asked in what way are children, the members of the human family who are especially liable to exhibit acute fatal tuberculosis commencing as an abdominal affection, most likely to obtain a large and fatally infective dose of tubercle bacilli ?

As already indicated by us, to this question there can be but one answer :—namely that the evidence which we have accumulated goes to demonstrate that a considerable amount of the tuberculosis of childhood is to be ascribed to infection with bacilli of the bovine

type transmitted to children in meals consisting largely of the milk of the cow.

In many cases of abdominal tuberculosis and in tuberculosis of the cervical glands, however, it must be recollected that the child may be injured by the ingestion of bovine tubercle bacilli in milk without a fatal result occurring. The cases of abdominal tuberculosis examined by us had all been fatal, that is, death occurred from a generalized tuberculosis or from some local condition resulting, with possibly two exceptions, from tuberculosis of the abdomen. But many cases of abdominal tuberculosis in children recover, though what proportion of these is due to the bovine bacillus and what to the human, we have no means of knowing at present. The cases of cervical gland tuberculosis investigated by us were all cases that recovered or were recovering after operation, and a large proportion of them were bovine in origin.

Although the potency of tuberculous cow's milk in the causation of the tuberculosis of infancy and childhood is clearly demonstrated, in our examination of material from 55 cases of tuberculosis in adolescents and adults we have found rarely in the former and extremely seldom in the latter the bovine bacillus colonizing the fatal lesions.*

Instead we found abundantly in these lesions none but the human bacillus, a circumstance which, if considered alone, might tend to discount the extent of the danger to the adult human subject not only of the milk of tuberculous cows but also of the flesh of that and other animals capable of fostering the bovine tubercle bacillus. But it must be remembered that we have found cases of tuberculosis in adult man, sufficiently extensive to incapacitate the patient for the ordinary duties of life and in two instances ending fatally, in which we were able to attribute the disease solely to the effects of the bovine tubercle bacillus. Though of the 55 cases of adolescent and adult tuberculosis which came under scrutiny no more than 5 yielded bacilli of the bovine type, we cannot say that this figure adequately represents the proportion of like cases obtaining among the tuberculous population generally.*

Meanwhile we, in view of the evidence adduced by us, regard ourselves as called upon to pronounce on administrative measures required in the present for obtaining security against transmission of bovine tubercle bacilli by means of food. In the interests therefore of infants and children, the members of the population whom we have proved to be especially endangered, and for the reasonable safeguarding of the public health generally, we would urge that existing regulations and supervision of milk production and meat preparation be not relaxed; that on the contrary Government should cause to be enforced throughout the kingdom food regulations planned to afford better security against the infection of human beings through the medium of articles of diet derived from tuberculous animals.

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* The 55 cases referred to include only those of tuberculosis other than lupus, cases of lupus coming under observation in adolescent and adult patients numbered 10, 3 of which yielded tubercle bacilli presenting the cultural characters of the bovine type though possessing less virulence for the calf and rabbit than the bovine tubercle bacillus.

More particularly we would urge action in this sense in order to avert or minimize the present danger arising from the consumption of infected milk. And in this connection it may be convenient for us to repeat certain facts observed by us in reference to the conditions tending to the elimination by the cow of bovine tubercle bacilli in her milk; facts in our opinion of such importance that they formed the subject of our Third Interim Report.

Bovine tubercle bacilli are apt to be abundantly present in milk as sold to the public when there is tuberculous disease of the udder of the cow from which it was obtained. This fact is, we believe, generally recognized though not adequately guarded against. But these bacilli may also be present in the milk of tuberculous cows presenting no evidence whatever of disease of the udder, even when examined *post mortem*. Further, the milk of tuberculous cows not containing bacilli as it leaves the udder may, and frequently does, become infective by being contaminated with the fæces or uterine discharges of such diseased animals. We are convinced that measures for securing the prevention of ingestion of living bovine tubercle bacilli with milk would greatly reduce the number of cases of abdominal and cervical gland tuberculosis in children, and that such measures should include the exclusion from the food supply of the milk of the recognizably tuberculous cow, irrespective of the site of the disease, whether in the udder or in the internal organs.

EFFECT ON MILK OF WATER OR WATERY FOOD GIVEN TO COWS.

Alleged Indirect Adulteration of Milk.

The attention of the Board of Agriculture was called during the past year to notices in the Press as to the conviction of a dairyman in the French Courts for selling adulterated milk. This conviction was based on the assumption that it is possible to water milk either by feeding cows on watery food, or by causing them to drink water in large quantities, or immediately before being milked. The Board were not aware of any sufficient evidence to show that when the total supply of nourishment is sufficient it is possible to increase the quantity of the milk, at the expense of the quality, by these means; and as they considered that the dissemination of incorrect information on this subject among Officers of Local Authorities and others might lead to hardships to dairymen, they referred the matter to the Agricultural Education Association, and arranged with them to conduct experiments at the Midland Agricultural and Dairy College to test the points raised.

Seven typical dairy cows were selected from the College herd. They were of the dual-purpose Shorthorn type. These cattle were stall-fed during the whole of the time the experiment was in progress. Their food consisted of concentrated and dry fodders with the addition of mangolds, and at stated intervals, viz., every seventh day, it was supplemented with a definite amount of salt.

The amount of water taken daily was measured by allowing each cow to drink from a graduated vessel. During the first week access

to water was continuous, during the second intermittent. Milking was regularly and expeditiously undertaken, the interval between successive milkings being ten and fourteen hours, evening and morning respectively. The effect of the salt was to be determined by the variation in the yield of milk and its quality. The latter was done by sampling the milk from each cow at each milking, and analysing the milk for fat and solids during the same day.

The cows were numbered 1 to 7, and the scheme was mapped out in days. On the first day cow No. 1 received 4 oz. of salt, on the second day cow No. 2 was salted, and so on. Thus one day in each week a cow received salt, and on every day of that week some one cow was receiving salt. For the first seven days each cow had free access to a measured quantity of water. In the second week she was allowed to drink only just before being milked. In the third week water was free, on the fourth intermittent. From the experience gained in the first two weeks the experiment was altered so that instead of giving 4 oz. of salt in one meal, 3 oz. were given after the night's milking on one day and 3 oz. after the morning's milking on the next day. The feeding of 6 oz. of salt caused purging.

The result of the experiment appeared to show that periodical doses of common salt administered to cows even to the extent of purging them, do not necessarily cause them to consume excessive quantities of water; and that the amount of water consumed by cows has no direct bearing on the composition of their milk yield.

(*Journal of the Board of Agriculture*).

Miscellaneous.

ROYAL COLLEGE OF VETERINARY SURGEONS.

Examinations in London.

At the meeting of the Board of Examiners held in London on July 14 for the Written, and on July 18, 19 and 20 for the Oral and Practical Examinations—

The following gentlemen passed their Final Examination :—

Mr. R. B. Cockburn
,, T. J. Davis
,, J. T. Edwards*
,, J. A. G. Gosling
,, G. V. Golding
,, F. E. Heath
,, H. E. Hornby
Mr. F. F. Horton
,, F. C. Minett
,, W. A. Pool
,, S. C. Rowbotham
,, S. Smith
,, W. P. Stokes
,, G. F. Steevenson*

The following gentlemen passed their Third Examination :—

Mr. V. Boyle
,, O. S. Broadhurst*
,, K. J. S. Dowland
,, J. Facer
,, E. S. Farbrother
,, J. Going
,, S. J. Gilbert*
,, W. P. Hamlyn*
,, A. C. Holl*
,, P. Howard
Mr. R. H. Knowles*
,, S. W. Marriott
,, W. F. Morton
,, E. B. Reynolds*
,, J. M. Smith
,, P. R. Viljoen
,, U. W. F. Walker
,, R. T. Davis
,, S. H. L. Woods

The following passed their Second Examination :—

Mr. W. A. Austin
,, C. E. W. Bryan
,, D. Blyth*
,, C. Davenport
,, H. W. Dawes†
,, G. van de W. De Kock*
,, G. O. R. Grey*
,, A. Hoskin*
,, R. C. G. Hancock
Mr. W. B. Howe
,, V. J. Hare*
,, G. C. Harding
,, H. Hicks*
,, W. H. Priston
,, J. M. L. Penhale*
,, J. Southall
,, W. L. Sheffield
,, A. R. Smythe*

The following passed their First Examination :—

Mr. C. O. A. Anderton
,, A. Bayly
,, R. M. Bamford
,, H. H. Curson
,, H. S. Cockburn
,, H. Chown
,, R. W. D. C. Easom
,, E. E. Jelbart
,, A. G. E. Lalor
Mr. O. H. Melck
,, C. Rammell
,, H. C. Rockett
,, T. S. Roberts
,, P. S. Sparling
,, F. H. Stainton*
,, J. F. D. Tutt*
,, C. H. S. Townsend
,, W. H. Wortley†

Marked thus * passed with Second Class Honours.
Marked thus † passed with First Class Honours.

Examinations in Liverpool.

At the meeting of the Board of Examiners held at St. George's Hall on July 14 for the Written, and on July 19, 20 and 21 for the Practical Examinations, which were held at the University of Liverpool, the following gentlemen passed their Final Examination, and were admitted Members of the Royal College of Veterinary Surgeons :—

Mr. P. McGregor
,, F. J. Richmond
,, G. G. Howard
Mr. D. R. Hoddinott
,, S. K. Jones*
,, T. Craig

The following passed their Third Examination :—

Mr. W. Andrew
,, H. Sumner*
,, A. L. Pollard
Mr. J. W. Proctor
,, R. Isherwood*

The following passed their Second Examination :—

Mr. A. B. Gately
,, J. Blackburn*
,, C. W. Elan†
Mr. C. Wadsworth
,, R. Dawbney*
,, J. A. Ward*

The following passed their First Examination :—

Mr. R. P. Holmes†
,, G. Lloyd*
Mr. E. N. Kinsey

Marked thus * passed with Second Class Honours.
Marked thus † passed with First Class Honours.

Examinations in Dublin.

At the meeting of the Board of Examiners held in Dublin on July 14, 20, 21, 22, and 24, the following gentlemen passed their Final

Examination, and were admitted members of the Royal College of Veterinary Surgeons :—

Mr. P. J. MacCormack
„ M. Cunningham
„ H. J. Reidy
„ J. M. Crowe
„ P. F. Dolan
„ H. W. Carbury
Mr. T. M. Doyle
„ P. D. English
„ T. F. O'Brien
„ T. Le B. Revington
„ J. Smith
„ N. D. Vakil

The following passed their Third examination :—

Mr. M. Brett
„ M. P. Glynn*
„ J. J. Cosgrove*
„ H. E. Irwin
„ J. R. Jackson
Mr. T. McD. Kelly*
„ T. O'Leary
„ J. Quinlan*
„ F. B. Sneyd
„ R. C. Wheeler

The following passed their Second Examination :—

Mr. A. E. Brandon
„ E. S. M. Morgan
„ T. G. Browne*
„ T. D. Condell
„ J. R. Ellison
„ D. C. Green*
„ M. P. Hatch
„ J. J. Hegarty
Mr. J. P. McNally*
„ J. J. Mills
„ J. J. Pomeroy
„ A. D. Preston
„ T. Reddin
„ C. M. Stewart
„ M. Toomey

The Following passed their First Examination :—

Mr. I. C. Blake
„ J. O'Carroll
„ W. A. I. Buchanan
„ T. A. Connolly
„ F. Daly
„ G. J. Delaney
„ H. Dolan
„ R. Hans
„ C. P. Fisher*
„ P. J. Hayes
Mr. H. Jewell†
„ M. J. Killelea
„ W. E. Little
„ P. J. Mulcair
„ O. D. Neary*
„ T. F. O'Connor
„ W. P. Power*
„ M. J. Ryan
„ G. K. Shaw

Marked thus * passed with Second Class Honours.
Marked thus † passed with First Class Honours.

UNATTACHED LIST FOR THE TERRITORIAL FORCE.

(*Extract from the London Gazette, dated Friday, July 7, 1911.*)

Albert Edward Mettam to be Lieutenant, for service with the Royal Veterinary College of Ireland Contingent, Senior Division, Officers' Training Corps. Dated May 18, 1911.

James Joseph O'Connor to be Lieutenant, for service with the Royal Veterinary College of Ireland Contingent, Senior Division, Officers' Training Corps. Dated May 18, 1911.

James Ferguson Craig to be Lieutenant, for service with the Royal Veterinary College of Ireland Contingent, Senior Division, Officers' Training Corps. Dated May 18, 1911.

George Thomas Dunne to be Lieutenant, for service with the Royal Veterinary College of Ireland Contingent, Senior Division, Officers' Training Corps. Dated May 18, 1911.

Francis Bernard Hayes to be Lieutenant, for service with the Royal Veterinary College of Ireland Contingent, Senior Division, Officers' Training Corps. Dated May 18, 1911.

Translations.

A CASE OF STERCORAL CONCRETION.

MESSIEURS CAZALBOU AND SERISE.

Veterinary Surgeons to the 50th Regiment of Artillery.

THE mare Utile, 15 years old, was taken with colic on January 29. The symptoms were not very pronounced; the subject remained lying down, sometimes in lateral decubitus, and at other times right on her back. There was slight abdominal tympany. Examination of the infirmary record showed that she had not been ill previously. The mare had been employed at the construction works at Rennes, and took her meals a little later than her battery comrades, so that on her arrival the ration had been encroached upon by her neighbours, but this threw no light upon the nature of the affection. There were no aloine evacuations; rectal exploration showed emptiness of the terminal portions of the intestine and incomplete repletion of the accessible regions of the great colon. There was borborygmus in the cæcum and colon, and pressure of the abdomen caused slight pain. Castor oil was given, and intestinal irrigation with the long enema tube effected. On February 8, after ten days' treatment, there was abundant diarrhœa, and cure appeared to be obtained.

On February 11 the old symptoms reappeared, and persisted remittently until March 3. Constipation was always present, but after three injections, some small, hard, blackish, moulded dung balls were passed. On March 3 the illness assumed an alarming stage, and after three hours' agony the mare died.

Autopsy.—On opening the abdominal cavity there was a notable quantity of drinking water mixed with alimentary matter. The stomach, of small volume, was almost empty; the small intestine of reduced calibre presented zones of hæmorrhagic congestion, and its mucosa was covered with viscous liquid. The large colon was congested throughout and full of semi-liquid matter in its first half, more abundant and solid in its terminal portion—about 75 cm. beyond the origin of this organ was a tranverse rent involving the three tunics with hæmorrhagic borders, and 15 cm. long.

In the terminal part of the large colon obliterating the origin of the floating colon, and completely arresting the course of the intestinal contents, was a hard almost spherical mass incomplete at one of its polar caps, of a diameter of 20 cm., and of stone-like aspect; it was a stercoral concretion, weighing 1⅓ kilogrammes.

Section showed a piece of coal in the centre surrounded by sand, and around this primitive foreign body a zone of impacted alimentary matter; a layer of sand and gravel surrounded this zone, and this in its turn was surrounded by a covering of felted alimentary material.

These two veterinary surgeons consider that the voidance of small dung balls of the kind here stated should constitute one of the symptoms of stercoral concretion, and that rectal irrigation should be insisted on. The position of this stone was, however, beyond the reach of the injections.

A few days after this case another mare, Férule, was attacked with colic whilst employed in the same work, and after treatment foreign matter was passed similar to that in the first case. To avoid recurrence of the complaint horses on the construction works have now been muzzled and their rations held back and only given to them on entering the stable.

(*Revue Générale de Médecine Vétérinaire.*)

ARTICULAR RHEUMATISM IN A DOG, FOLLOWED BY NECROSIS OF EXTREMITIES.

By Chief Veterinary-Surgeon FREISE.

Some time ago I was called to a five months old German sheep dog, well nourished and strong, which, according to the owner, had become suddenly stiff in the night and refused his food. The patient was lying completely prostrate and curled up in his basket. If called by his owner or offered milk he would not get up, but remained lying and whining with closed eyes. If one tried to straighten him out he curled up again, and when brought out he cried with pain.

The temperature was 40.9° C., the pulse 150, the breathing 45 per minute. The appetite was quite gone, and look anxious.

Closer examination showed that both fore-legs were greatly swollen at the carpus. The swellings were right round the joint and felt hot and tense. On the anterior surface of the right carpus slight fluctuation was discernible. As soon as slight pressure was put on the joint the animal shrieked with pain and tried to bite.

Examination of the heart and lungs showed nothing abnormal. The diagnosis was articular rheumatism.

Treatment.—Rubbing the joint with spirits of camphor and clothing the whole body in flannel. Internally, one of the following powders was given daily for three days:—

℞ Hydrargyrichlorat mit. 0.03 grm.
Sacchari 0.2 grm.
M. ft. pulv.

Against the loss of appetite:—

℞ Acidi hydrochlor } āā 5.0.
Pepsini ... ... }
Aqu. dest 300.0.
M. ft. solutio,

and further 0.3 of salol three times daily.

After seven days of this treatment the joint swellings declined and the patient moved about slowly in the room. The tempera-

ture declined to 39.7. But after three more days the condition got worse. The temperature rose to 41.7° C., the respirations to 52, and the pulse to 176 per minute. Patient kept to his basket, groaned and gnashed his teeth with pain. Closer examination showed that the right knee was greatly swollen, chiefly on its internal side, so that the dog could not use it. Treatment was continued and a warm bath at 30° C., with turpentine added, was given. After the bath the dog was dried and covered with flannel. Fresh milk and raw minced meat were given. After three and a half weeks he could move about fairly well, but limped on the fore feet and right hind foot. The weather being fine and hot, he lay down at the door basking in the sun. Cold wet weather coming on after this his condition got worse again. His gait was stiff and he lay in his basket and howled. The swellings round the joints became hot and painful; at some places the hair fell out, and at others there was a greasy, evil smelling secretion. The hairless places were greyish blue in colour, of leathery consistence, and completely non-sensitive to needle-pricks. Sloughing of the skin then occurred on both fore-legs, at the points of the tail and ears. The necrosis of the ears spread from the points to the middle of the aural muscles, and the distal half of the ears dried up. A piece 4 cm. long fell off the end of the tail. For some days it appeared as if the dog would die, but finally he was bathed in a one per cent. creolin solution and his lying place disinfected. He has now recovered, has a good appetite, and is lively.

(*Zeitschrift für Veterinärkunde.*)

Letters and Communications, &c.

G. Mayall; P. R. Thompson; Lieutenant Stewart; Secretary, Royal College of Veterinary Surgeons; Secretary, Royal (Dick) Veterinary College; L. M. Douglas; E. W. Bevan; Major Baldrey; Mr. A. W. N. Pillers.

Books and Periodicals, &c., Received.

Journal of Meat and Milk Hygiene; Journal of the Royal Army Medical Corps: Proceedings of the Royal Society of Medicine; Board of Agriculture and Fisheries: Department of Agriculture and Technical Instruction for Ireland; Tropical Agriculturist; Agricultural Journal for the Union of South Africa; Bureau of Animal Industry.

NOTE.—All communications should be addressed to 8, Henrietta Street, Covent Garden, London, W.C. Telephone, 4646 Gerrard. Telegrams, "Baillière, London."

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